THE EFFECTS OF COGNITIVE STYLE UPON CHANGES IN CAREER MATURITY FOLLOWING EXPOSURE TO A SYSTEM OF INTERACTIVE GUIDANCE AND INFORMATION

By

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Saint Elmo Cherry

This Dissertation is
Dedicated to My Mother
MRS. BEATRICE CHERRY
for Her Love, Encouragement,
and Inspiration.

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This study investigated the relationship between community college students' cognitive style and the effectiveness of a computerized career guidance decision-making tool (A System of Interactive Guidance and Information (SIGI)) in producing changes in career maturity.

A total of 200 students participated in this investigation. These students enrolled in behavioral science or career development courses responded to a pretest administration of Crites' Career Maturity Inventory (CMI), Witkin's Group Embedded Figures Test (GEFT), and the Nelson-Denny Reading Test before initiation of the SIGI treatment and No SIGI treatment. After finishing SIGI, all students (SIGI, No SIGI) responded to a posttest administration of the CMI.

This investigation addressed itself to the following four kinds of behavior:

1. What is the relationship between students' scores on the Witkin's Group Embedded Figures Test and the pretest administration of the Crites' Career Maturity Inventory?

2. What is the relationship between field-dependent and field-independent orientation and the value profile found in the Values section of SIGI?

3. What is the relationship between field-dependent and field-independent orientation and cluster of occupations found in the Locate section of SIGI?

4. Which of the two factors, state (SIGI or No SIGI treatment) or trait (field-independence or field-dependence), contribute the most to changes in career maturity when students are in a behavioral science course? Does one of the factors make a greater contribution to changes in career maturity or is there an organism environment interaction?

A major assumption guiding this investigation was that an individual difference dimension, such as cognitive style, must be recognized and granted equal prior status as a possible determinant of career maturity or career development. There was no reason to assume that individual differences along such dimensions of cognitive style would not exert any influence upon the effectiveness of the treatment SIGI. Because the SIGI treatment was implemented in a manner that makes explicit use of a decision-making model, it was most appropriate to study the influence of an information processing style (cognitive style) upon the effectiveness of that treatment.

The following is a summary of the findings:

(1) A positive correlation existed between degree of field-independence and pretest level of career maturity as measured by the CMI. A positive correlation was also found with career maturity and verbal ability.

(2) Value preferences were different for field-dependent and field-independent subjects. The average field-dependent values profile was significantly different from the average field-independent values profile.

(3) The SIGI system returned occupational selections to research subjects in a manner that was not fully consistent with expectations based upon cognitive style.

(4) SIGI was clearly effective for improving career maturity regardless of cognitive style. However, field-dependent subjects experienced the most growth in career maturity after exposure to SIGI. Results suggested a nonlinear relationship between initial level of career maturity and effectiveness of the SIGI treatment.

Cognitive style and the SIGI treatment were both significantly associated with the ending levels of career maturity. This association with ending levels was independent of the results found for the improvement in career maturity discussed above and remained significant when the pretest levels of career maturity were controlled for.

A significant sex difference was found for the change in career maturity. The male subjects experienced the greatest gain in career maturity after exposure to SIGI (again independent of cognitive style). There was also somewhat of a sex/treatment interaction in which cognitive style was, again, not directly related.

CHAPTER I
INTRODUCTION

In recent years, considerable attention has centered upon the study of stylistic dimensions in the performance of cognitive tasks (Ohnmacht, 1967). These dimensions have been conceived of as cognitive styles which identify a person's manner of perceiving, thinking, and problem solving. Cognitive styles have been described as the distinctive ways in which individuals come to grips with reality (Broverman, 1960). During the last two decades a rapidly accumulating body of information, theory, and research has focused upon the identification of differing cognitive styles, and the study of their relationships to personal functioning has been investigated.

One of the most systematically investigated dimensions in the area of personality research has been the research done by Herman Witkin and his colleagues in their study of individuals with field-dependent and field-independent cognitive styles. Witkin began his work on this personality dimension in the late 1940s with a study (1962) of how the individual orients himself in space. The strikingly consistent patterns of individual performance which Witkin observed here triggered almost two decades of research on the personality/perception relationship and demonstrated convincingly that the individual's perceptual performance is related in a consistent way to highly diversed areas of cognitive functioning.

Most of Witkin's research has been based upon three perceptual tests: the Body Adjustment Test (BAT), the Rod and Frame Test (RFT), and the Embedded Figures Test (EFT). Each of these test situations requires the subject to keep an item (his body, a luminous rod or a geometric design), separated from the context of which it is a part. The subject is thus required to relate analytically with a field of configuration (Karp, 1963).

The ways in which cognitive styles are manifested can be illustrated by considering two of the tests used to assess an individual's standing on the field-dependence-independence dimension.

> In the body-adjustment test, the person is seated in a small tilted room and required to adjust his body to the upright while the room remains in its initial position of tilt. Field-dependent subjects tend to align the body with the tilted room, suggesting that the surrounding visual field has been used as the primary reference for determining the position of the body. Relatively field-independent subjects bring the body close to the upright, regardless of the position of the room. They thus use experiences from within the body as a primary reference.
>
> Individual differences of a similar nature are found in the rod-and-frame test. In this situation, the subject sits in a completely darkened room facing a tilted luminous frame within which is a tilted luminous rod. The subject is required to make the rod vertical. Field-dependent people tend to bring the rod into alignment with the tilted frame, reflecting use of the main axes of the frame as a basis for judging the upright. Field-independent people adjust the rod close to the upright, reflecting use of the felt position of the body. With regard to extent of reliance on self or field, people tend to be consistent in performance across these two tasks and others of a similar nature. In part because of this self-consistency, these modes of functioning have been called styles (Witkin, Moore, Oltman, Goodenough, Friedman, Owen, and Raskin, 1977, p. 197).

The mode of perception which reflected the ability to distinguish from "field" in this analytic fashion and to differentiate objects from embedding backgrounds was designed by Witkin as field-independent. The contrasting way of perceiving, which reflects submission the dominant organization of the field and the inability to keep an item separate from its context, was designated field-dependent.

The cognitive style dimension has had the widest application to problems in education; such as, how students learn, how teachers teach, how teachers and students interact, and how students make their educational-vocational choices and perform in the area of their choice (Witkin, Moore, Goodenough, and Cox, 1975). It is the area of educational-vocational behavior which is of most interest here. A more recent application of this dimension has been upon the role of cognitive style in career differentiation. This work reflects the increasing attention that has been given over the past decade to the role of variables other than interests and abilities in career decision-making.

Another characteristic of the past decade has been the development of new approaches to career guidance. This is any systematic activity designed to facilitate career exploration of career decision-making. Some approaches to career guidance include methods of individual developmental counseling, a variety of group counseling programs, career education curriculums, the use of multi-media techniques, and the application of computer technology to information dissemination and career exploration. However, many of these approaches have been influenced by career development theories. The general purpose of these approaches has been to assist an individual in accomplishing the tasks associated with the particular stage of career development in which he or she is located. The focus is on the process of decision-making rather than on the content of the decision-making process.

The process of career decision-making involves collecting information, internalizing it, and applying it during the course of making decisions about careers. This process seems to represent a highly sophisticated form of concept formation. A more useful method of studying the relationship between field-dependence-independence and career decision-making appears to be through careful study of the process students actually go through in making career choices. Thus, the issue here is to see if there is any relationship between cognitive styles, whether they be field-dependent or field-independent, and decision-making processes.

The use of computer assisted systems in career guidance has been one of the many recent techniques developed and is a promising approach in facilitating career exploration and decision-making. One such system is the System of Interactive Guidance and Information (SIGI), presently in operation at Santa Fe Community College in Gainesville, Florida. SIGI was designed by Educational Testing Service to assist community college students in career decision-making by providing values clarification experiences, information dissemination, and strategy planning.

Rationale

Presently, there is a growing body of research on the role of cognitive style in career differentiations. A major reason for interest in the part cognitive styles may play in career differentiation is that, because of their nature, cognitive styles offer a promising alternative to an abilities approach to career differentiation. Although work has not progressed to the level of identifying ways in which information about cognitive styles may be used in the service of interventions in career choices and career decision-making, the questions to be investigated suggest that such information may enrich and broaden understanding of the complex process of career differentiation.

Rational decision-making is an active mental process where the student processes information in keeping with his value structure. That is, a student will select occupational activities that allow agreement between the environment and his expectations. When doubts arise in a student's mind, he experiences uncertainty as to how best to pursue his objective. The elements of indecision and subsequent decision begin to form. Thus, the focus is on the process of decision-making as to how to make the transformation of elements from a state of indecision into a state of resolution or solution.

Fishburn (1964) has stated that there are major steps involved in transition: (1) to recognize, discover, or construct ways in which the individual may proceed (such ways are called course of action and strategies); (2) to evaluate alternative strategies by means of a criterion choice (the maximation of the individual's expected value) among strategies; and (3) to determine the best strategy for the individual to follow, adopt, and implement.

Recently, Witkin and his colleagues have begun to explore the relationship of field-independence and field-dependence to concept formation. This relationship of field-independence and field-dependence to concept formation is not a highly developed area in the literature. One study reported by Katy Darlington (1978) at Rutgers University, related this cognitive style to career decision-making. However, a possible method for investigating the relationship between field-independence and field-dependence and career decision-making appears to be through the process of making career choices.

One computer-based program designed along this format is SIGI, developed by Educational Testing Service. It assists students in exploring their career values, deciding on educational and vocational fields, and making plans for implementing these decisions.

Purpose of the Study

The purpose of this study is to determine the effects of cognitive style upon changes in career maturity following exposure to a system of interactive guidance and information. It is designed to investigate ways through which students make decisions about careers; and, it is designed to investigate ways by which counselors can assist students in making sound career choices based on cognitive style. The following questions will be investigated:

1. What is the relationship between students' scores on the Witkin's Group Embedded Figures Test and the pretest administration of the Crite's Career Maturity Scale?
2. What is the relationship between field-dependent and field-independent orientation and the values profile found in the Values section of SIGI?
3. What is the relationship between field-dependent and field-independent orientation and clusters of occupations found in the Locate section of SIGI?
4. Which of the two factors, state (SIGI or no SIGI treatment) or trait (field-independence or field-dependence), contribute the most to changes in career maturity when students are in a behavioral science course? Does one of the factors make a greater contribution to changes in career maturity or is there an organism environment interaction?

Definition of Terms

Cognitive style is an individual's personal approach used in learning, problem solving, and in reasoning situations. It is an individual/personal way of perceiving, thinking, sensing, interpreting, and processing information (social, academic, etc.). It focuses on perceptual and intellectual functioning transcending traditional distinctions of cognitive processes and perceptual processes.

Field-independence means that an individual functions without the influence of his surroundings. That is, parts of the surrounding field is experienced as discrete from organized background. The field-independent person relies on internal stimuli which is operational, independent of his surroundings. He, because of his independence of field, constitutes a source of mediating mechanisms for restructuring the field on his own; that is, he goes beyond the information given. This reliance on internal stimuli permits him to function autonomously in interpersonal relations. He prefers more solitary impersonal situations; he is more concerned with ideas, theoretical and abstract principles; and, he is low in social sensitivity and social skills.

Field-dependence means that an individual functions in such a way that he allows his surroundings to influence his behavior. That is, perception is dominated by the overall organization of field. He is more likely to go along with the dominant proponents of the stimulus field. Unlike the field-independent person, the field-dependent person relies on external stimuli because he finds it more favorable to behave under field influence, rather than behaving independent of field. Field-dependent people make use of external frames of reference in defining their attitudes; they prefer interpersonal situations where they can become involved with others; they are high in social sensitivity and social skills; they are less autonomous because external stimuli limits personal autonomy; and, they are low in cognitive restructuring skills because of the inability to separate and operate independent of field.

Career Maturity is the degree and rate of vocational development. Degree of vocational development refers to the maturity of an individual's vocational behavior as indicated by the similarity between his behavior and that of the oldest individuals in his vocational life stage. In contrast, rate of vocational development refers to the maturity of an individual's vocational behavior in comparison with that of his own age group.

SIGI is a System of Interactive Guidance and Information. This is a computer-based guidance system designed to help students to make rational and informed decisions about careers.

CHAPTER II
REVIEW OF THE LITERATURE

The review of the literature for this investigation will be divided into the following broad topics: historical development of vocational counseling, focus of career development theories, development of cognitive style (in personality, education, and careers), the System of Interactive Guidance and Information, and summary of the literature.

Historical Development of Vocational Counseling

Vocational guidance got its start in the early years of the present century. It was one of the many reactions to the awesome impact of the industrial revolution upon social relationships (Demos and Grant, 1965). Reed (1944), in observing that social movements do not originate but that they evolve, has stated that events which mark the beginnings of the vocational guidance movement actually were symbols of changes in the established cultural pattern. It began through the harshness of industrial growth and often ruthless conflict, of "robber barons," of sweatshops, child labor, and struggles of labor for recognition and rights, or intellectual and theological conflicts typified by controversies over Darwinism, of national expansion westward and the passing of free land, and of agrarian troubles and revolt (Borow, 1964). Its roots are woven throughout the social fabric of our society.

Social thinkers like Frank Parsons were influential in the vocational guidance movement. He is often called the "father of vocational guidance." Parsons began his work at the Vocational Bureau, in Boston to improve the post-high school placement of students.

Parsons' observations and interactions with these students led him to the conclusion that they needed systematic assistance in deciding on a vocation. He concluded that there were three steps necessary in selecting a vocation: (1) man analysis (a study of a student's capabilities, interests, and temperament); (2) job analysis (the students study occupational requirements and employment possibilities); and (3) true reasoning on the relationship between the above two sets of data (Shertzer and Stone, 1968). Other social forces that influenced the advent of vocational counseling were the child study movement, the psychometric movement, compulsory education, the depression and war periods, and federal government support.

Focus of Career Development Theories

Later, out of these social movements, emerged theories of career behavior and career counseling. Various theorists had similar and different focal emphases for each theory. Tolbert (1974) classifies theories of vocational behavior according to major themes: (1) developmental, which focuses on developmental stages, tasks or phases, typically as aspects of a life long process; (2) needs, which are considered the paramount determinants; (3) psychoanalytic, which deals with personality dynamics; (4) sociological factors, which include the home, school, and community; (5) decision-making, which focuses on the way the individual utilizes information, self-knowledge, and perceptions of rewards in making successive choices involved in career development; and, (6) existential, which focuses on choices, becoming and fulfilling potentialities.

Osipow (1968) discusses four distinct approaches in assessing vocational behavior: (1) trait-factor approach, which assumes that a straightforward matching of an individual's abilities and interests with the world's vocational opportunities can be accomplished; (2) sociological and career choice approaches, which state that circumstances beyond the control of the individual contribute significantly to career choices he makes, and that the principle task confronting the individual is learning behavior techniques developed for coping within his social environment; (3) self-concept approach, which suggests that the individual develops a more clearly defined self-concept as he matures and that personal self-images are usually congruent with occupational self-images; and (4) vocational choice and personality approach holds that individuals select jobs that satisfy needs (social and psychological). The latter approach will be given some attention in this investigation; that is, looking at personality styles as they relate to perceptual styles.

It is important to note when referring to personality trait factor, research on personality style is consistent with the research found on cognitive styles. Izard (1960) compared engineers with men in general. Findings showed engineers earned high scores on needs achievement, order, dominance, and low on helping others. Steiner (1953) found engineers to be independent, self-directing, possessing few friends, and having a positive attitude toward authority. Roe (1961) reported that eminent scientists were found to be independent, self-sufficient, liking to bring about order out of disorder, having impluse to control, having low intensity in interpersonal relations, and preoccupied with things rather than people. Martin and Bendig (1961) found females from a group of college freshmen and sophomores to be higher in social dependency needs. Kuhlen and Dipboye (1959) found college students in elementary education to be high in sociability and friendliness. According to Osipow (1968), the personality style approach is the richest conceptually. It leads to a more comprehensive understanding of vocational behavior.

Within these major themes and approaches to vocational behavior, vocational theorists have focused on individual's abilities, interests, pattern of choices, personality, and/or needs. Each theory attempts to explain the vocational behavior of individuals and provides some insight into career patterns in the educational process.

The key element in career counseling and guidance is the decision-making process. Zytowski (1968) discusses Tiedeman's career development theory. Tiedeman's analysis of vocational development is oriented by several decisions with regard to school, work, and life which a person makes as he matures. The problem of deciding may be divided into two periods--a period of anticipation and a period of implementation. Tolbert (1974) states that the decision-making process begins when one encounters a problem, or experiences a need, and realizes that a decision must be made. Gelatt (1962) suggested a "sequential decision-making" conception of vocational development could provide counselors with a consistent, workable frame of reference. Hershenson and Roth (1966) state that the value of the decision-making model for vocational development lies as much in its implications for the overall process of vocational development as in its contribution to the understanding of individual decisions within the process. Through the decision-making process, two basic trends are brought about in an individual's vocational development. These trends may be conceived of as coming about through the following process:

1. Each vocationally-relevant decision limits the range of possible subsequent experiences for the individual.
2. As the range of experiences becomes narrower, the range of alternatives open to the individual becomes narrower.
3. As the range of alternatives becomes narrower, the individual becomes more focused on a given course through one or more of the following causes:
    a. positive choice
    b. adaptation to existing conditions
    c. ignorance of other possibilities
    d. inability to shift to other alternatives
4. The more focused on a given course the individual becomes, the more likely it is that he will perceive or structure future events as consistent with that course, thus reinforcing it.

Ziller (1957) states that vocational choice is a decision-making situation in which risk plays a major role. Decision-making is always, or practically always, done under conditions of uncertainty. Preference for risk may vary with different individuals (Tolbert, 1974). Decision-making is central to the vocational-educational process.

Such factors as aptitudes (including academic aptitude or intelligence), occupational interests, personality characteristics, economic conditions, and especially, decision-making are important in the process of career development. The use of psychological measurements for assessment provides information about the aforementioned factors. Tyler (1959) states that interest tests provide information about an individual's characteristic pattern of preferences and aversions. Interests are related to occupational choice; they are only slightly related to abilities.

Development of Cognitive Style

The need for the inclusion of cognitive styles as a factor to consider when assisting individuals in career decision-making situations suggests that cognitive styles offer a hopeful alternative to an abilities approach to career differentiation. Witkin and his associates have been studying ways in which individuals process their experience; they have developed reliable ways to appraise a characteristic called "psychological/-perceptual differentiation." The discussion that follows has obvious implications for the need for inclusion of cognitive styles in career counseling.

People differ in the way they orient themselves in space. Witkin et al. (1962) report that the process of perception must be studied in the context of the overall psychological organization of the individual perceiver. It is not enough to determine the way in which one person's perception in a given circumstance is related to that of a number of other people; it is important to consider how his perception is related to his own motivation, emotions, etc.

There were investigations by Wertheimer, Gibson, and Mower which attempted to determine the factors responsible for maintenance or proper orientation toward the upright in space (that is to say, perception of position of an object within the field, of one's own body, and of the whole field). This perceptual process is of importance to the individual, since it involves his body directly and constantly enters into the individual's adjustment to the environment. It is clear that in order to establish whether a given impression of the upright is formed with reference to the visual framework or with reference to body position, or on the basis of both, the individual must in some way separate these two sets of determining factors (Witkin et al., 1962).

Witkin standardized three tests used to determine space orientation. The Rod-and-Frame Test, the Tilting-Room-Tilting-Chair Test, and the Rotating-Room Test (Witkin and Asch, 1948) together represent all fundamental aspects of perception of the upright. Witkin and Asch (1948) found that under a given test condition each person performed in a very consistent way. It was also found that women tended to be more dependent on the visual field, and to use body experiences less effectively than men. This suggested that differences in modes of perceiving revealed by the tests are related to profound differences among people. It showed that in perceiving position with relation to the true vertical direction, individuals differed from one another in relative extent of dependence on the visual field or in relative ability to utilize bodily experiences in overcoming the influence of the field. In many ways, the evidence suggested that each person tended in different orientation situations to exhibit a characteristic way of perceiving, which was not readily subject to change, and which was associated with other more general aspects of his psychological structure (Witkin et al., 1954).

The three orientation tests present the individual with all the main aspects of orientation toward the upright. These tests investigate the way in which the individual establishes the direction of an object within a visual field, the direction of the field as a whole, and the position of his own body. These tests were designed to reveal the extent to which the individual, when making such determinations, adheres to the axis of the visual field, or the individual resists the influence of the field through reference to sensations of body positions.

The Rod-and-Frame Test (RFT)

> The test evaluates the individual's perception of the position, in relation to the upright, or an item within a limited visual field. The subject is placed in a completely darkened room, facing a luminous frame which surrounds a movable luminous rod. With the frame tilted, the subject is required to bring the rod to a position that he perceives as upright. For successful performances of this task the subject

> must "extract" the rod from the tilted frame through reference to body position. The subject is tested on some trials while sitting erect, so that it is relatively easy to refer to the body in establishing rod position, and on other trials while tilted, so that it is more difficult to use the body. On all trials, a large tilt of the rod when it is reported to be straight indicated adherence to the visual field; a small tilt indicated independence of the field and reliance on the body (Witkin et al., 1954, p. 25).

The Tilting-Room-Tilting-Chair Test (TRTC)

> This test evaluates the subjects' perception of the position of the body and the whole surrounding field in relation to the upright. The way in which the subject establishes the position of his body is determined by seating him in a tilted field, and requiring him to bring his body to a position that he perceives as upright. If he tilts his body far in the direction of the tilted field in order to make himself straight, he is judging his position in terms of his apparent relation to the field. If, on the other hand, he brings himself close to the true upright, he is resisting the influence of the field and showing marked awareness of pressure sensations. To determine the manner in which the subject establishes the position of the whole surrounding field, the room in which he is seated is tilted, and he is asked to bring it to an upright position. If he reports the room straight at its initial tilt, he is accepting its vertical axis as the true upright. If, on the other hand, he succeeds in making the room truly straight, he is perceiving its position in relation to the felt position of his body . . . (Witkin et al., 1954, p. 27).

The TRTC is made up of two parts: 1) The Room-Adjustment Test (RAT) consisting of various angles to which a room can be tilted. 2) The Body-Adjustment Test (BAT) consists of various trials of room and chair to the same side at different angles (Witkin et al., 1962, p. 39).

The Rotating-Room Test

> This test is very similar to the tilting-room-tilting-chair test, except that in the latter the visual frame of reference is basically altered by tilting the field, here postural factors are basically altered by rotating the subject about a circular track, so that the vector of the force felt by his body is the resultant of the downward pull of gravity and an outward-acting centrifugal force. As in the tilting-room-tilting-chair test, the subject is required to adjust his body or the room in which he is seated to positions that he perceives as vertical. Both are objectively upright at the beginning of each trial. . . .
> If the subject is very attentive to the postural sensations produced by the force of his body, he will tilt body and room toward alignment with his force. If he goes along with the visual field, on the other hand, he will tend to perceive body and room as straight in their initial positions. . . (Witkin et al., 1954, p. 31).

In addition to space orientation tests, non-orientation perceptual tests were developed to gain more knowledge and understanding of perceptual processes revealed by the orientation tests. Witkin developed the Embedded Figures Test (EFT). The EFT is a perceptual test. The simple and complex figures which make up the EFT are modifications of figures selected from those used by K. Gottschaldt in his classical studies of the relative roles of contextual (field) factors and past experiences in perception. In the work of Gottschaldt, the sought after simple figure was hidden into the complex figure, but perceptually obscured by means of line patterns. For example, the outlines of the simple figure might form the boundaries of various subpatterns in the complex figure, so that the simple figure will in effect lose its identity as a separate perceptual unit (Witkin et al., 1971).

It is clear from our earlier discussion of the space-orientation tests that in all of them successful performance depends on the ability of an individual to deal with a given configuration analytically, or to separate item from field. To be more specific, in the RFT, the subject must be able to disregard the tilted frame if he is to bring the rod to the true vertical. To determine whether a given degree of ability to deal with an item independently of its surroundings is a pervasive characteristic of a person's perception, the EFT was devised.

The Embedded Figures Test

> The embedded-figures test is a paper-and-pencil test which requires the subject to find a particular simple figure within a larger complex figure. The simple figure is "hidden," to a greater or lesser extent, by being incorporated into the pattern of the larger figure; for example, its outlines may form boundaries of several prominent subpatterns of a complex figure. Depending on the structure of the complex figure, detection of the simple figure may be very easy or very difficult. . . .
>
> The subject is first shown the complex colored figure, then a copy of the simple figure it contains, and finally the complex figure again, with instructions to locate the simple figure in it.

> Simple and complex figures are never shown together. To familiarize the subject with the procedure, a practical trial is given at the beginning of the series. The subject's score is the mean amount of time taken to find the simple figures within the complex ones, and it provides a measure of the extent to which its perception is influenced by the context in which an item occurs. . . (Witkin, 1950, pp. 1-15).

This is an approach wherein the person brings with him an array of situations of a given structure. This approach is the individual's perceptual or cognitive style. The construct Witkins applied to the style at issue here is field-dependence-independence. Cognitive styles are the characteristic, self-consistent modes of functioning which individuals show in their perceptual and intellectual activities (Witkin et al., 1971).

Field-Dependence-Independence

Klein (1959) reported in a study of field-dependence-independence and its relation to the TAT, Rorschach, and Figure Drawing Tests that individuals who were field-dependent were (1) generally passive in dealing with the environment, (2) lacking in self-awareness and having relatively poor control of impulses and high anxiety, and (3) having low self-esteem, including low evaluations of the body and body image. Field-independent individuals were said to be (1) active in dealing with the environment, (2) having awareness of inner life and having effective control of impulses, with low anxiety, and (3) having high self-esteem, including confidence in the body and a relatively adult body image.

Witkin et al. (1962) state that field-independent individuals appear cold and distant to others, and tend to be more individualistic, while field-dependent individuals make favorable first impressions. They are gregarious, affectionate, considerate, and tactful.

Witkin et al. (1977) show further evidence that field-dependent individuals are more likely than field-independent individuals to make use of external social frames of references in defining their attitudes, particularly under conditions of ambiguity. Field-dependent individuals make greater use of their external references. They engage in behaviors that will make such references available to them when needed. These behaviors add up to a social orientation.

Field-independent individuals, in contrast, are likely to have a nonsocial orientation. These differences have been identified in a variety of specific kinds of social behavior. Field-dependent individuals are relatively attentive to social cues provided by others, whereas field-independent individuals are relatively insensitive to such cues. Field-dependent individuals also prefer interpersonal situations in which they are involved with others; field-independent individuals prefer more solitary impersonal situations. Field-dependent individuals are more interested in other people; field-independent people are more concerned with ideas and abstract principles. Thus, field-dependent individuals show greater skill in getting along with others. They tend to describe themselves as friendly, considerate, warm, affectionate, polite, tactful, accommodating, non-evaluative and accepting of others, they like people and are liked by others, and make others feel comfortable with them. On the other hand, descriptions of field-independent individuals include, among other characteristics, being inconsiderate, rude, demanding, ambitious, interested in power, opportunistic, and they manipulate people as a means of achieving personal ends.

The contrasting cognitive styles and patterns suggest that, with regard to level, the field-dependence-independence dimension is bipolar, in the sense of having a clear high and low end. Thus, field-independent individuals are high in cognitive restructuring skills as well as in personal autonomy and low in social sensitivity and social skills. Conversely, field-dependent individuals are high in social sensitivity and social skills and low in restructuring skills and personal autonomy (Witkin et al., 1977; Witkin and Goodenough, 1977).

Research on Field-Dependence-Independence

Evidence from various studies indicates ways through which field-dependent persons show their social orientation. It has been demonstrated that field-dependent persons, more than field-independent persons, look more at the faces of others (Witkin et al., 1975; Konstadt and Forman, 1965; Nevill, 1972). The selective interests of field-dependent persons in social environments is not limited to faces. These are studies that suggest that field-dependent persons attend more to verbal messages and cues within a social context (Witkin et al., 1975; Eagle, Fitzgibbons, and Goldberger, 1966).

In addition to being sensitive to social cues, having interest in what others say and do, field-dependent persons are drawn to people. Holley (1972) and Justice (1970) demonstrated that field-dependent persons prefer to be physically close to others. In both studies, field-dependent persons took positions significantly closer to the person with whom they were interacting than did the field-independent persons.

Greene (1973) examined nonverbal behavior of obese patients when seated two to five feet from the interviewer. At the greater distance compared to the short one, field-dependent patients showed a significant increase in a cluster of nonverbal behaviors such as: palms-up gesture, mouth touching, and forward leaning. This loaded the dependency factor interpreted as an expression of need for closeness to others. Field-independent persons were unaffected by distance manipulation. At both distances, however, field-independent persons when compared to field-dependent persons showed significantly more nonverbal behavior such as: arm crossing, leg crossing, and absence of forward leaning. This loaded the distance factor interpreted as a reflection of a need to gain psychological distance (independence) from others.

In contrast to the personal social orientation of field-dependent persons, field-independent persons tend to have an impersonal social orientation when relating to others. Evidence suggests that field-independent persons on a personality inventory showed themselves to be insensitive to social undercurrents. Field-independent persons were also described as being cold and distant with others, very much unaware of their social stimulus value, and highly individualistic and autonomous (Pemberton, 1952; Witkin et al., 1975). In addition, evidence shows that field-independent persons are more likely to be interested in the abstract and the theoretical (Biggs, Fitzgerald, and Atkinson, 1971; Witkin et al., 1975).

Educational Implications of Cognitive Styles

Witkin et al. (1975) have summarized field-dependent persons as being particularly interested in and selectively attentive to social cues in their social environment. Because of this social orientation, such persons are better at learning materials with social content. However, relatively field-dependent and field-independent persons seem not to be different in sheer learning ability or memory. Thus, reflecting differences between them in what is relevant, attended to, and what strikingly stands out, field-dependent persons tend to be better at learning and remembering social material than persons who are relatively field-independent.

Ruble and Nakamura (1972) examined the role of cognitive style in learning social material. As a result, the field-dependent children showed better learning than did the field-independent children on the problem which featured only the social cues. Field-independent children showed better learning on the problem which did not involve any social cues. It was evident from these findings that field-dependent children were better at perceiving social cues and using these cues in learning.

Fitzgibbons (1965) used an incidental paradigm in which subjects were given a learning task to perform while in another section of the room, separated by curtains so that sounds could not be heard, a planted subject in another experiment called out words. Among these words were some that had social connotations and others that were neutral. At the end of the experiment, the subjects were unexpectedly asked to recall any words they had heard from the other side of the curtain. The field-dependent subjects recalled more social words than did the field-independent subjects. However, for the neutral words there was no difference between the field-dependent subjects and the field-independent subjects.

Such findings suggest that field-dependent persons are better at remembering social material. This superiority in learning is based on field-dependent persons' selective attention to social material.

Witkin et al. (1975) state that different kinds of reinforcement influence students' cognitive ways of learning. Field-independent persons with an articulated cognitive style are likely to have internalized frames of reference to which they adhere as guidelines to self-definition. This is maintained separately from external social references.

Evidence suggests that field-independent persons tend to learn more than field-dependent persons under conditions of intrinsic motivation.

In a study by Steinfeld (1973) eight and eleven year olds played an experimental game called "marble in the hole." The nonpreferred hole was reinforced. The effects of the three reinforcements were compared. One type of reinforcement was abstract, a flashing light came on when the marble was dropped in the nonpreferred hold. In this situation, the light served as a cue for self-reward. As expected, the field-independent children learned more than did the field-dependent children. Thus, field-independent persons are likely to analyze a field when the field is organized. They are also likely to impose structure on a field when the field lacks organization of its own.

Studies seem to indicate that field-dependent and field-independent persons tend to favor different learning strategies. If this is so, perhaps teachers should have different styles for teaching. Research on the role of teachers' cognitive styles in their approach to teaching has used the social-versus-impersonal orientation as points for investigating classroom behavior of teachers with contrasting styles.

According to Witkin et al. (1975), field-dependent teachers favor teaching situations which allow interaction with students; field-independent teachers prefer teaching situations that are impersonal in nature and situations more oriented toward more cognitive aspects of teaching. Wu (1968) found that field-dependent student teachers in social studies ranked discussion as more important to the practice of good teaching than either lecture or discovery approaches. Lecture and discovery approaches were favored more by field-independent teachers. When studying patterns of verbal teaching behavior, Moore (1973) found that the field-dependent teachers tended to use questions as instructional tools more frequently than did field-independent teachers.

Field-independent teachers tended to use questions when introducing topics and following student answers. The field-dependent teachers used questions primarily to check on student learning following instructions. Consequently, Ohnmacht (1967) found that field-independent teachers are more direct in their attempt to influence students. Field-dependent teachers have a more favorable attitude toward the use of democratic classroom procedures than did field-independent teachers.

Career Differentiation

Presently, there is a growing body of research on the role of cognitive style in career differentiation. Cognitive styles are bipolar, offering a promising alternative to an abilities approach to career differentiation (Witkin et al., 1977). On a continum, Witkin et al. describe field-dependence and field-independence as being opposites, representing contrasting styles. Because persons at each end of the continum are high in some characteristics and low in others, it is not better or worse to be located at one pole or another. Although work has not progressed to the point of identifying ways in which information about cognitive styles may be used in interventions of career decision-making, the evidence reviewed suggests that such information may broaden our understanding of the complex process of career differentiation (Witkin et al., 1977). Evidence drawn upon in examining the role of cognitive style in career differentiation comes primarily from an accumulation of literature over the past few years.

Educational-Vocational Orientation at Early Ages

Research has shown that cognitive style may begin to influence career differentiation quite early in life. Witkin et al. (1977) reported that at eighth and ninth grade levels, conceptions of educational-vocational domains are more articulated among field-independent children than among field-dependent children.

Earlier studies have shown that boys have a more positive orientation toward science and mathematics than do girls. In a longitudinal study by Witkin et al. (1962, 1974), it was found that in high school relatively field-independent students chose mathematics and science courses as electives more frequently than field-dependent students.

Educational-Vocational Interests

Field-dependent and field-independent cognitive styles play a guiding role in directing people toward interpersonal or impersonal domains in important real-life activities. Witkin et al. (1977) have demonstrated that relatively field-dependent persons are likely to favor educational-vocational domains that feature a social content and that require interpersonal relations for their conduct. This does not require any analytical restructuring. In contrast, relatively field-independent persons are likely to favor domains in which social content and interpersonal relations with people are not involved. These persons have analytical skills and cognitive restructuring skills, which are primarily abstract and nonsocial in content. They tolerate an impersonal orientation.

Witkin et al. (1975) and Pierson (1966) report that the responses of field-independent persons to standard interest inventories are consistent with those of persons in mathematics and science domains. Examples are mathematicians, physicists, chemists, biologists, architects, engineers, physicians, dentists, and psychiatrists. Field-independent persons have also shown interest in teaching mathematics-science, industrial arts, and vocational-agricultural courses. These mentioned teaching areas as well as the health professional areas, all require analytical/restructuring compentence. Pierson (1966) found that field-independent persons also show interest in practical domains such as production manager, carpenter, forest service, farmer, and mechanic. Field-independent persons give clear evidence of theoretical interests (Adcock and Webberley, 1971; Pemberton, 1952).

In contrast, the interests field-dependent persons show on interest inventories fall in the interpersonal domains that require social skills. One cluster of interests frequently shown is in the welfare-helping domain. They include social worker, minister, rehabilitation counselor, probation officer, teaching social sciences, elementary school teaching, and business administration. Other vocational interests frequently shown by field-dependent persons are shown in persuasive-activities domains such as, marketing, advertising, and administrative activities which involve dealing with people (i.e., personnel director, community recreation administrator, public school superintendent, and chamber of commerce director) (Witkin et al., 1975; Witkin et al., 1977).

Educational-Vocational Choices

The educational-vocational choices of field-dependent and field-independent persons are consistent with their interests just reviewed. Field-independent persons favor impersonal, analytical domains which require cognitive restructuring skills. Field-dependent persons favor interpersonal, nonanalytical domains which do not call for cognitive restructuring skills (DeRussy and Futch, 1971; Osipow, 1969; Witkin et al., 1975). Thus, in the academic setting, field-independent college and graduate students have been found to specialize in fields such as mathematics, the sciences, experimental psychology, engineering, architecture, art, surgical nursing, and mathematics-science teaching. Field-dependent students have been found to choose specialized fields such as clinical psychology, social work, elementary school teaching, and psychiatric nursing (Witkin et al., 1975; Witkin et al., 1977).

Considering the perceptual process involved in career differentiation, it is evident that field-independent persons are likely to show interest in the aforementioned cognitive domains, to choose them for specialization, and to perform better in these domains once the selection has been made. Witkin et al. (1977) have shown in a longitudinal study of high school, college, and graduate students, a tendency for students to shift their choices over time toward compatibility with their cognitive styles. Consequently, field-dependent students who favored mathematics or natural sciences as their college majors tended to shift out of these domains by the time of college graduation; field-independent students who made the same preliminary choices were likely to remain in choosen domains.

Investigations of vocational achievement in relation to cognitive styles are few in number, but reported results are consistent with expectations. High-achieving surgical student nurses were found to be field-independent, and high achieving psychiatric student nurses tended to be more field-dependent (Quinlan and Blatt, 1972). According to Witkin et al. (1975), persons who have high achievement tend to score higher on the verbal comprehension sections of intelligence tests than do persons with low achievement. Thus, persons with high scores in intelligence suggest that these persons have high ability. So persons with high ability tend to score higher on the perceptual tests in the field-independent dimension. Field-dependent persons tend to score lower.

Sex Differences in Relation to Cognitive Style

Investigations on sex differences are of some significance in relation to cognitive styles. In accord with expectations, many studies have found sex differences in some behavior manifestations are suggestive of a developed sense of separate identity. A sense of separate identity implies experience of the self as segregated from nonself; it also implies experience of the self as structured. Persons who have developed a sense of separate identity have developed an awareness of one's own needs, feelings, and attributes which they recognize as their own and which they identify as distinct from those of others (Witkin et al., 1962; Witkin et al., 1975). A sense of identity might manifest itself through a limited need for guidance and support from others and/or ability to establish and maintain attitudes and judgements, without continuous reference to external standards; thus, lending itself to a more stable self-view.

Witkin et al. (1962) have shown a tendency for women to be more field-dependent than men. Women as a group have been described as being more dependent on others than men. They are also superior to men in memory for names and faces. They are more likely than men to use external references for definition of attitudes and judgements. In both perceptual and analytical situations, men tend to be more analytical than women. This is so in part because of traditional cultural sex roles of women. This suggests that men are field-independent and women are more field-dependent.

Witkin's et al. (1977) findings show that male college students strongly favor mathematics and natural sciences. Women tend to favor educational courses and social sciences. Also, the women who conform less to the traditional life styles and who may venture into a masculine area tend to be more field-independent than women who adhere to the traditional sex role of women. Those women who became mathematics majors scored higher on the mathematics aptitude section than men; and, they scored higher on the Group Embedded Figures Test (GEFT) than men. Thus, women who were found in the natural sciences and mathematics academic performance surpassed that of men.

Career Maturity

Crites (1961) defines career maturity in terms of two independent constructs--degree of vocational development and rate of vocational development. Degree of vocational development refers to the maturity of an individual's vocational behavior as indicated by the similarity between his behavior and that of the oldest individuals in his vocational life stage. In contrast, rate of vocational development refers to the maturity of an individual's vocational behavior in comparison with that of his own age group.

To measure career maturity, John Crites developed the Career Maturity Inventory (CMI). This instrument was designed to measure maturity of attitudes and competencies necessary for career decision-making. He developed the Career Maturity Inventory Attitude Scale to measure two dimensions: (1) career choice attitudes and (2) career choice competencies.

According to Crites, the Attitude Scale elicits the feelings, the subjective reactions, the dispositions that an individual has toward making a career choice. The Scale surveys involvement in the career choice process, orientation toward work, independence in decision-making, preference to career choice factors, and conception of career choice process.

The Competence Test is comprised of five subtests designed to measure cognitive variables involved in choosing an occupation. These include how well the individual can appraise his job-related capabilities (strengths and weaknesses), how much he knows about the world of work, how adept he is at matching personal characteristics with occupational requirements, how foresighted he is in planning for a career, and how effectively he can cope with the problems that arise in the course of career development (Sorenson, 1974; Hansen, 1974). Only the Attitude Scale was used in this investigation.

Validity, Reliability, and Use of the CMI-Attitude Scale

The reliability of the Attitude Scale was determined by the internal consistency method and the test-retest method. Internal consistency coefficients of .74 were determined by the Kuder Richardson formula. These coefficients are comparable to other instruments similar to the Attitude Scale and are consistent with theoretical expectations since the instrument was designed to measure related but not identical measures of vocational attitudes.

A test-retest reliability coefficient of .71 was reported for 1,648 subjects in grades 6-12 over a one year period. This level of reliability coefficient is acceptable (Crites, 1973).

A System of Interactive Guidance and Information

The use of computer assisted systems in career guidance has been one of the most recent techniques developed and is a promising approach in facilitating career exploration and decision-making. The System of Interactive Guidance and Information (SIGI) is a computer-based guidance system designed to help students to make rational and informed decisions about careers. This system is based on theory of guidance developed over many years by Dr. Martin Katz, a senior research psychologist at the Educational Testing Service in Princeton, New Jersey.

In this guidance system, the student interacts with the computer in such a way as to examine and explore his own values, obtain and use relevant information, interpret predictive data, and formulate plans. This kind of interaction helps the student to arrive at tentative career decisions and to modify these decisions as he gains new insights and additional information. These decisions involve both educational and occupational options. The emphasis is not merely on the content of decisions; instead, the emphasis is on the process of decision-making (Chapman, 1975).

The main purpose of SIGI is to enhance the student's freedom of choice, to develop his understanding of elements involved in the choice, and to increase his competence in the process of making informed and rational decisions. The goal is to help students to become the conscious instrument of their own career.

SIGI consists of four major subsystems: Values, Information, Prediction, and Planning. Values is the heart of the SIGI system. It provides the dimensions along which students analyze their desires and along which they construe occupational characteristics. "The values system is the medium through which students explore their wants and desires and sort out the demands of each" (Chapman, 1975, p. IV-1). The purposes of this section are to insure that each student explores and considers a broad range of occupational values, to clarify the rewards and satisfactions pertaining to occupations, and to facilitate careful examination and exploration of these values.

The Values section examines ten occupational values and weighs the importance of each. The student begins to develop an understanding of what he wants in an occupation and what he is willing to give up. The values are high income, prestige, independence, helping others, security, variety, leadership, interest field, leisure, and early entry. The student's first step involves designating a relative weight for each of the above values. Then, the student is confronted with a series of values dilemmas and must choose between hypothetical occupations representing a pure manifestation of each value. After several rounds of the values game, SIGI points out any inconsistencies between the student's previous weighting of his values and his preferences indicated during the process of playing the values game. The student is then given an opportunity to re-weight his values. This time he has the restriction that the sum of weights must equal forty points. After manipulating all the values to equal forty points, the student gets a print-out. This is the student's profile of values (Chapman, 1975).

Locate, the second subsystem, asks the student to consider any five values ranked in order. The student chooses different values to search for occupations with different profiles, or the student may reduce or increase his specifications to retrieve more or fewer occupations.

The Compare subsection allows the student to find answers to a great variety of questions about any three occupations simultaneously. He may ask specific questions about work activities, income, educational requirements, personal satisfactions, conditions of work, or opportunities and outlook.

The Prediction subsection is in the form of experience tables. These tell the student the percentage of students entering his local community college with test scores and previous marks like his own. Predictor variables include student self-estimate of grades in a particular course, high school grades, aptitude or achievement tests, and previous college grades. SIGI processes this information to assist the student in determining his chances for a particular grade in a course (Katz et al., 1972).

The Planning subsection assists the student in planning steps to implement his occupational choice. Planning elicits displays of programs for entrance to various occupations and listings of colleges in a local region offering suitable majors.

The Strategy subsection proposes strategy for combining all elements to reach a decision. The emphasis of strategy is placed upon the method of making decisions rather than results. Occupations are evaluated in respect to the rewards offered and the risk of entrance when it involves the uncertainty of completing all the steps for arriving at a rational career choice (Chapman, 1975; Katz et al., 1972).

Chapman and Katz (1973) found in a pilot study at Mercer County Community College in New Jersey that students who had experienced SIGI reacted favorably. Students gave SIGI mean grades between three and four on each of the following characteristics and accomplishments: (1) interest level, (2) clarity of direction, (3) helpfulness in achieving increased awareness of values, (4) understanding the relationship between values and career decisions, (5) selecting occupations that fit values, (6) gathering information about occupations, (7) understanding expressed predictions, (8) getting and planning programs of study, and (9) learning to make mature decisions about careers.

Devine (1976) sought to determine the effects of SIGI on student's career maturity as a measure by the Career Maturity Inventory. Using a randomized-Solomon-four group design with 84 students, no significant effects on career maturity were found.

Pyle (1977) found that the SIGI program does appear to relate significantly to student's career maturity, whereas the Awareness of Career Decision Making (ACADEM) did not. Sampson's (1978) findings suggested that counselor intervention had an equivocal effect on student's attitudes as a result of being exposed to SIGI. When student evaluations were taken into account, SIGI provided a comprehensive approach to career exploration and decision-making that can be utilized as a total unit without support strategies.

Summary of the Literature

Various social, economic, educational, and psychological forces have encouraged and facilitated the growth of vocational counseling. Frank Parsons, who is sometimes called the "father of vocational guidance," focused on student's capabilities, interests, and attitudes. These factors are still central themes today when helping a student in career decision-making.

Vocational theorists' (like Super, Roe, Ginzberg, Holland, to mention a few) central vocational themes were the self-concept, needs, interests, capabilities, and personality traits. Also, many psychological test and interest inventories attempted to elicit many of the aforementioned characteristics in facilitating career decision-making.

Herman Witkin and associates have a different approach to career decision-making. His approach is a perceptual one. This approach overlaps with Osipow's personality approach to vocational behavior. To determine how an individual functions perceptually, Witkin developed three instruments to determine how individuals differ in space orientation. These tests were the RAT, BAT, and EFT. Witkin found that people differ in the way they orient themselves in space. After studying how individuals use their perceptual field, tests revealed specific segments of behavior which ground together in several definite clusters. These reflect the quality of an individual's experience of his environment, his way of perceiving and using his body, the nature of his relationship to other people, and aspects of his controls and defenses (Witkin et al., 1962). Such patterns of behavior suggested consistency in an individual's psycho-social-perceptual functioning.

As a result of these findings, Witkin and his associates concluded that individuals have two ways of perceiving things. They called them the field-dependence and the field-independence. Field-dependence suggests that the individual relies on his environment for clues. He is unable to separate self and body from space. As a result, these individuals use external social frames of reference to define their attitudes, they are attentive to social cues provided by others, and they have a social orientation. On the other hand, field-independence suggests that the individual is capable of separating self and body from space. As a result, unlike field-dependence, they use internal frames of reference to determine attitudes; this internal frame of reference permits individuals to function autonomously in social surroundings. They are able to restructure their environment giving it organization, whereas field-dependents are not. They are insensitive to social cues provided by other people. They are more concerned with ideas and abstract principles; and they have a nonsocial orientation.

Because of these findings, cognitive styles can offer variables other than abilities in career decision-making. They also show a stronger relation to choices than interests in career decision-making. Consequently, field-dependent people, because of their social orientation, tend to favor courses and occupations which require involvement with other people such as sociology, psychology, social studies, law, elementary school teaching, counseling, and rehabilitative counseling. Field-independent people, because of the nonsocial orientation, tend to favor courses and occupations that do not require interaction with people such as astronomy, engineering, mathematics, natural sciences, physical sciences, medicine, experimental psychology, and art.

In both intellectual and perceptual situations, men tend to be more analytical than women. Thus, women tend to be more field-dependent than men. This suggests another variable for women and men when considering decision-making about careers. Evidence on career differentiation suggests that cognitive styles (field-dependence-independence) play an identifiable role in individual's educational and vocational development. People seem to favor domains fitted to their cognitive styles and to choose these domains for specialization.

CHAPTER III
RESEARCH METHODOLOGY

To determine the effects of cognitive style upon changes in career maturity following exposure to a system of interactive guidance and information, an experimental design was employed. The system of Interactive Guidance and Information (SIGI) has been investigated in several previous studies (Pyle, 1977; Devine, 1976; Sampson, 1978). In these investigations, the effectiveness of SIGI as a career information resource, a counseling tool for fostering career decision-making skills, and treatment for developing career maturity were studied. None of these studies made any attempt to determine the presence of nor magnitude of any interaction of individual differences within subject's cognitive style dimension.

The proposed investigation used the change occurring between pretest and posttest administration of the Career Maturity Inventory (CMI) as the dependent variable. One independent variable will be the presence or absence of the SIGI treatment when used in conjunction with behavioral science instruction from the area of Student Development at Santa Fe Community College. This independent variable was an environmental factor, or a treatment. The exposure of subjects to the SIGI treatment did occur for the experimental groups while the control group was not exposed to the SIGI treatment.

The two levels of the other independent variable was each subject's assignment to a field-independent or field-dependent group. The group assignment was made depending upon the subject's performance on the Group

Embedded Figures Test (GEFT). Subjects earning high scores on the GEFT were assigned to field-independent groups and subjects earning low scores on the GEFT were assigned to the two field-dependent groups. These two independent variables, each of two levels, were used in a fully-crossed (othogonal) analysis of covariance design (Snedecor and Cochran, 1967).

This design allowed for a quasi-experiment[1] to be executed that investigated the potential interaction between a state (environmental) variable and a trait (within subject) variable. Focusing upon the state-trait interaction is a perspective that allowed the investigator to observe simultaneously the influence of a personality or cognitive style variable upon a dependent variable in conjunction with the influence of an environmental or treatment variable (Ekehammar, 1974). This interactionist approach allowed the subjects to be studied as more than a mere passive recipient of an environmental treatment (SIGI) while permitting a high degree of rigor in the subject's exposure to that treatment. In this research design, the experimental space is a behavior situation (Bowers, 1973). This enabled the researcher to study the influence of two factors, one being experimental or situational and the other being organismic, upon changes in career maturity.

Because a fully factorial design was used, the experiment was sensitive to the influence of either factor (cognitive style or treatment) determining a change in career maturity independently or in interaction.

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[1] Campbell and Stanley's (1963) term "quasi-experiment" is best used. Subjects for the four groups were drawn from intact classes at Santa Fe Community College.

The arguments of social learning theory (Mischel, 1973), suggests an interdependence of, or interaction between, environmental treatments and within subject characteristics, such as cognitive style, that vary along dimensions of individual differences.

Population

The population of this study was composed of students enrolled in the area of Student Development at Santa Fe Community College. The general emphasis of these courses is based on group interaction. The emphasis is on the individual and the various environments (social, psychological, or physical) one experiences during a day, a week or a month. It offers the student an opportunity to explore and examine his values, ideas, perceptions, and attitudes about psycho-social predicaments as well as problems pertaining to educational-vocational planning.

Selection of Subjects

In selection of subjects making up the experimental and control groups, this study used the GEFT for assignment of the population to field-independent or field-dependent groups. In addition, students were assigned to control or experimental groups by use of a procedure that uses random number tables (Snedecor and Cochran, 1967) with class rosters to insure true random assignment to the four groups. Use of these procedures insured random assignment and eliminated any biasing due to group assignment.

Four groups of a minimum of twenty-two subjects were formed for this proposed study. The students identified as field-independent and exposed to SIGI in conjunction with the behavioral science course were the experimental group #1; students identified as field-dependent and exposed to SIGI in conjunction with the behavioral science course were experimental group #2; students identified as field-independent and receiving only the behavioral science course and no SIGI treatment were control group #1; and, students identified as field-dependent and receiving only the behavioral science course and no SIGI treatment were control group #2. Each of the four groups had the vocabulary section of the Nelson-Denny Reading Test administered in conjunction with the Group Embedded Figures Test (GEFT) and only the Attitude Scale of the Career Maturity Inventory (CMI). This battery of three instruments enabled the identification of field-independent and field-dependent cognitive style, the estimate of reading level and general academic aptitude as shown by the vocabulary score, and the initial assessment of career maturity prior to the start of the treatment.

Controlling for Ability

The practice of good experimental design has always required that the researcher identify the dependent (measured or criterion) variable and independent variable or variables prior to the execution of the experiment and collection of data (Snedecor and Cochran, 1967). Traditionally, the single independent variable that is hypothesized as influencing the dependent variable was allowed to vary under the researcher's control, and any other variables (organismic or environment) that could potentially influence the dependent variable were held constant (Plutchik, 1974).

In this research design, one variable that could potentially influence the dependent variable (change in career maturity) is general verbal ability as measured by performance on the Nelson-Denny Reading Test. Cronbach (1970) has discussed research showing that vocabulary performance has high predictive validity for students performance in general scholastic endeavors. A wide variety of general academic and verbal skills were probably used by the students during use of SIGI.

It is important to insure that this verbal ability (which could influence the quality of the student's interaction with SIGI) be controlled. The verbal ability was used as a covariate in the experiment and was not allowed to interfere with the influence of cognitive style (the independent variable under manipulation) by statistical means. All subjects performed on the reading test at the pretest administration. It was found that general verbal ability correlated with cognitive style, the reading test score was used to adjust group means in the analysis of covariance and insured an unbiased experiment. For example, if the field-independent subjects have a significantly higher mean reading score than the field-dependent subjects, this would constitute a biased representation of high verbal ability (which is designed to hold constant) to confound the influence of the independent variable (cognitive style) upon the dependent variable (change in career maturity). The use of the reading score as a covariate removed its influence from the experiment in interaction with the cognitive style factor and insured that the influence of cognitive style upon career maturity was observed in isolation. This allowed the maximum generality to be obtained from the interpretation of the results of this investigation.

Experimental Design

The various tasks in the research program prior to start of the treatment were displayed as follows:

Behavioral Science sections (STD 1100)	Nelson-Denny Reading Test	Group Embedded Figures Test	Career Maturity Inventory
#1	X	X	X
#2	X	X	X
#3	X	X	X
#4	X	X	X

From these initial activities, the four groups previously discussed will be selected:

	SIGI	No SIGI
Field-independent	POSTTEST X	POSTTEST 0
Field-dependent	POSTTEST X	POSTTEST 0
	Experimental Group	Control Groups

X = SIGI and Behavioral Science course.
0 = Behavioral Science course only.

It should be noted that subjects placed into any one of the four groups had an equal probability a priori of coming from any one of the Student Development courses. This procedure had the advantage of allowing a random assignment of students from each Student Development course into the four groups used in the experiment. This served to reduce a potential source of bias and to contribute to the validity and generalizability of the results. In summary, the experimental design appeared as follows:

Group	Result of Group Embedded Figures Test	Reading Test	CMI	Treatment	CMI
Experimental_1	Field-independent	X	X	SIGI	X
Experimental_2	Field-dependent	X	X	SIGI	X
Control_1	Field-independent	X	X	No SIGI	X
Control_2	Field-dependent	X	X	No SIGI	X

Research Questions

This study addresses itself to the following four issues:

1. What is the relationship between students' scores on the Witkin's Group Embedded Figures Test and the pretest administration of the Crites' Career Maturity Inventory?

2. What is the relationship between field-dependent and field-independent orientation and the value profile found in the Values section of SIGI?

3. What is the relationship between field-dependent and field-independent orientation and cluster of occupations found in the Locate section of SIGI?

4. Which of the two factors--state (SIGI or no SIGI treatment) or trait (field-independence or field-dependence)--contribute the most to changes in career maturity when students are in a behavioral science course? Does one of the factors make a greater contribution to changes in career maturity or is there an organism environment interaction?

Hypotheses

Ho_1: There will be no significant difference between field-dependent and field-independent groups on initial career maturity score.

Ho_2: There will be no significant difference between field-dependent and field-independent groups in the values structure found in the SIGI Values section.

Ho_3: There will be no significant difference between field-dependent and field-independent groups on clusters of occupations found in the Locate section of SIGI.

Ho_4: There will be no significant difference between field-dependent-independent groups upon change in career maturity after finishing SIGI.

Instrumentation

The Career Maturity Inventory (CMI) was developed by John O. Crites. It was designed to measure the maturity of attitudes and competencies necessary for realistic career decision-making (Hansen, 1974). (An earlier discussion is on page 29.)

The Group Embedded Figures Test (GEFT) was developed by Herman Witkin, Philip Oltman, Evelyn Raskin, and Steven Karp. The GEFT is a perceptual test. It was designed to provide an adaptation of the original individually administered Embedded Figures Test (EFT) which would make possible group testing.

The GEFT has been modeled as closely as possible on the individually administered EFT with respect to mode of presentation and format. It has 18 complex figures, 17 of which were taken from the EFT. The subject's task on each trial is to locate a simple figure within a large complex figure which has been so organized as to obscure or embed the sought-after simple figure. Scores on the GEFT reflect the extent of competence at perceptual disembedding. The underlying stylistic dimensions were formulated as a result of various studies on perceptual intellectual performances. This style was designated field-independence and field-dependence. In a field-dependent mode of perceiving, perception is strongly dominated by the overall organization of the surrounding field. In the field-independent mode of perceiving, parts of the field are experienced as discrete from organized groups. Thus, students who disembed more figures accurately score high on this test. They are designated field-independent. Students who disembed fewer figures score low on this test. They are designated field-dependent (Witkin et al., 1971).

> Since the GEFT is a speed test, an appropriate method of estimating reliability is the correlation between parallel forms with identical time limits. Correlations between the 9-item First Section scores and the 9-item Second Section scores were computed and corrected by the Spearman-Brown prophesy formula, producing a reliability estimate of .82 for both males (N = 80) and females (N = 97). These reliability estimates compare favorably with those of the EFT.
>
> The correlations between GEFT and EFT are reasonably high, particularly for men. Correlations between GEFT and the Portable Rod-Frame-Test (PRFT) and correlations between EFT and RFT fall toward the lower end of the range of correlations (Witkin et al., 1971, pp. 28-29).

The Nelson-Denny Reading Test was developed by M. J. Nelson and E. C. Denny. This test provides a measure of all three major elements of reading ability: vocabulary, comprehension, and reading rate. Reading plays a significant role in both academic and professional success that it merits special attention and consideration. Studies have shown that individuals with high ability tend to be higher achievers on test and academically perform better than persons with low ability. (In this study, the Nelson-Denny was used to control for ability.) The knowledge of how well one reads can help make decisions about education and vocational planning.

Evidence of validity may be judged statistically by referring to the reliability coefficients and correlations with other measures, such as course grades and scores on other tests. However, the most convincing evidence of validity must come from personal examination of the test content by the user. Items must be examined one by one to see if it meets local objectives.

The split-halves reliability coefficient is the most commonly used statistic for determining test reliability. It is not very appropriate for a test such as the Nelson-Denny Reading Test where speed plays an important role (Nelson-Denny, 1973).

Collection of Data

In addition to the results from the various standardized instruments used in this study (Nelson-Denny Reading Test; GEFT; and the CMI) detailed information will be collected during the student's interaction with the computer (SIGI). The SIGI software has the capacity to store detailed records of each student interaction with the computer during use of the SIGI treatment. This detailed data collection was permitted during the course of the research and individual student records containing the students' behavior in all sections of the system was controlled. Particularly relevant to this research was the final adjusted values profile the student obtains at the end of the Values section and the recommended job lists returned by SIGI to the student in the Locate section. The SIGI software creates these individual files during student use of the system and stores them on the disk. The Santa Fe SIGI installation has the software required to interpret these files and produce the Values profile and selection of recommended occupations returned in Locate. The data from the Values profile and job selections in Locate were used in this study.

Experimental and Control Group Procedures

Subjects for the two experimental groups were selected from the initial population pool of four sections of courses from the area of Student Development at Santa Fe Community College. All subjects performed on the GEFT, the vocabulary portion of the Nelson-Denny Reading Test, and the CMI at beginning of data collection. Subjects scoring below the four group median on the GEFT were identified as field-dependent, while those scoring above the median were identified as field-independent.

Half of the group was randomly assigned to experimental group #1 and received the SIGI treatment in conjunction with class instruction. The remaining half of the field-independent subjects were assigned to control group #1 and received only the class instruction.

The students identified as field-dependent were used to form another experimental group. Half of the field-dependent subjects were assigned randomly to experimental group #2 and received the SIGI treatment concurrent with the class instruction. The remaining field-dependent subjects were identified as control group #2 and did not receive any SIGI treatment. The control groups received only class instruction.

Prior to the administration of the initial battery of tests, informed consent forms were administered. Students who had had any previous exposure to SIGI were identified and not included in the initial subject pool from which the groups were selected. This precaution insured that no students with previous SIGI exposure appeared in the experimental groups or control groups.

After group selection, both control groups began using the SIGI system while participating in the class instruction. Concurrently, the two control groups participated in class instruction and were asked to refrain from the use of SIGI during the experimental period. Near the end of the term, all four groups performed for a second time on the Career Maturity Inventory. The progress made in SIGI was monitored for both experimental groups and all students were encouraged to finish the entire six subsections of SIGI. The computer automatically stored detailed records of each experimental subject's interaction with the SIGI system.

Data Analysis

Data analysis procedures for each of the four hypotheses were discussed separately. A minimum alpha value of .05 (allowing a 95% confidence interval) was assumed for successful rejection of all Null hypotheses.

Ho_1: There will be no significant difference between field-dependent and field-independent groups on initial career maturity score.

This hypothesis was tested with a one-way analysis of variance (Snedecor and Cochran, 1967). The population was divided into field-independent and field-dependent classifications after the initial battery of tests. The identification of each subject as field-independent and field-dependent defined the two levels of the independent variables used for the analysis of variance. The dependent variable was the initial pretest CMI score.

Ho_2: There will be no significant difference between field-dependent and field-independent groups in the values structure found in the Values section of SIGI.

This hypothesis was tested by using a multivariate discriminant analysis (Harris, 1975). A discriminate analysis was appropriate for the testing of the hypothesis of no difference between groups when multiple dependent variables comprise the phenomenon being measured. The values profile in SIGI has eight dimensions. Raw scores from each student's value profile was restandardized relative to the full subject pool to connect for restrictions of range and insure that the assumptions of the discriminant analyses are met. The standardized measures will then be used in a two-group discriminant analysis. The discriminant analysis tested for which value dimensions, if any, are able to reliably distinguish (discriminate) between the field-independent and the field-dependent groups using SIGI.

> Ho_3: There will be no significant difference between field-dependent and field-independent groups on clusters of occupations found in the Locate section of SIGI.

This hypothesis was tested by using a 2 x C contingency table analysis (Snedecor and Cochran, 1967). This generalization of Chi-square analysis allowed the proportion of one group (field-independent) that is pointed to a particular occupation in Locate section to be compared with the proportion of another group (field-dependent) for which the Locate section suggests that same occupation. This multidimensional technique allowed one contingency table to be constructed with the two groups as one dimension and the number of occupations being compared as the other dimension. A finding of significance in the full table (2 x C) allowed the investigator to perform the binomial distribution. This form of hypothesis testing was suitable for data covered using a nominal level of measurement (Kirk, 1969).

> Ho_4: There will be no significant difference between field-dependent and field-independent groups upon change in career maturity after finishing SIGI and the behavioral science course.

This hypothesis was tested by using a two factor fixed effects analysis of covariance (Snedecor and Cochran, 1967). All data from the contingency scaled indices (Nelson-Denny Reading score, CMI pre and post) were assembled for each of the four groups. There was no need to transform any raw data to meet the assumptions of the analysis of covariance. The CMI post score was the dependent measure. There were two covariates: the CMI prescore and the Nelson-Denny vocabulary score. The two independent variables each had two levels (field-dependent vs. field-independent and the SIGI treatment vs. no SIGI treatment control group). The two independent variables were orthogonal (fully crossed).

The sources of variation included in the analysis of covariance were as follows:

1. Covariates
    - A. Nelson-Denny Reading Test
    - B. CMI pretest
2. Main Effects
    - A. Treatment (SIGI/control group)
    - B. Cognitive style (field-dependence-independence)
3. Interaction
    - A. Treatment x cognitive style
    - B. Residual (error term)

This analysis tested the appropriateness of the covariates, the effects of the presence or absence of the treatment separately, the effects of cognitive style separately, and the interaction of the treatment (state) and cognitive style (trait).

Limits to Generality

Campbell and Stanley (1963), in discussing experimental and quasi-experimental design in the social sciences, have identified internal and external threats to validity as posing the primary limits to the interpretability of experiments. Internal threats to validity, such as the effect of the presence or absence of the treatment and the effects of any interaction between the treatment and cognitive style, were controlled by the use of the 2 x 2 pretest-posttest control group design. The 2 x 2 analysis of covariance allowed CMI changes to be studied for significant effect while controlling for the effects of the treatment. The design allowed for the effect of cognitive style upon CMI changes to be studied independently. Campbell and Stanley have mentioned that the pretest-posttest control group design of which this research design is a factorial extension. It controlled for the following internal threats to validity: history, maturation, testing, instrumentation, regression, selection, experimental mortality and interaction of selection, and maturation.

The fundamental question posed by external validity is to what populations, settings, treatment variables, and measurement variables can the observed effects be generalized? Specifically, to what group of students and classroom conditions might the findings of this research design be applicable? Whereas the quality of internal validity determines the limits of the precision of the experimental design and testing of effects, the factors subsummed under external validity could have limited the meaningfullness of the experiment in its practical application. This research considered not only the effects of an environmental treatment upon changes in career maturity, but it also studied the effects of a cognitive style dimension upon changes in career maturity. In this way, such internal and external threats to validity and generality were minimized.

The addition of the cognitive style factor allows the researcher to consider the effects of an individual difference dimension upon changes in career maturity. This cognitive style dimension could have interacted with the treatment to produce the maximum gain in career maturity. The inclusion of this factor allowed the knowledge gained from the study to be generalized to a larger domain than would be the case if any individual traits or aptitudes of the subjects were not being considered. Previous research on career maturity and computer assisted guidance (Pyle, 1977; Devine, 1976; Sampson, 1978) failed to consider any individual differences in dimensions such as cognitive style and hence suffered from a decrease domain of generality relating to this research.

Maximum generality of the results of this research required several assumptions: (1) The students in the four sections of classes from Student Development were representative of the freshman population at Santa Fe Community College and similar schools. This was necessary for results to be readily generalizable to freshmen populations at schools such as Santa Fe Community College. (2) The time limits imposed upon the completion of the experiment did not mask any effects that may have occurred. The variability within the groups on the CMI measures were similar (homogenous) enough, the analysis of covariance was capable of detecting sufficient changes in the control group.

CHAPTER IV
THE FINDINGS

Pretest Performance

The research was conducted and the data collected according to an approved research design. The pretest instruments consisted of the Nelson-Denny Reading Test, the Career Maturity Inventory (CMI), and the Group Embedded Figures Test (GEFT). The two hundred subjects enrolled in Behavioral Science and Career Development courses at Santa Fe Community College responded on the pretest instruments prior to the initiation of the SIGI treatment for the SIGI group. The results obtained on the GEFT were used to classify subjects into the field-dependent and field-independent groups.

The full subject pool had pretest performance that was characterized by an average GEFT score of 17.7 with a standard deviation of 10.7. The standard error of the mean was .76. The mean CMI score was 34.3 with a standard deviation of 7.9 and a standard error of 5.6. The Nelson-Denny Reading Test mean score was 18.3, the standard deviation was 16.69 with a standard error of 1.2.

The entire group of students was divided into four separate groups as determined by the results on the GEFT and was assigned into SIGI (treatment) and No SIGI (control) groups. Of the entire subject pool, 98 were assigned to the SIGI treatment and each sugject was required to complete the SIGI system. For this treatment group, the mean pre-CMI score was 33.5, with a standard deviation of 8.9 and a standard error of

.90. The mean GEFT score was 20.1 with a standard deviation of 11.3 and a standard error of 1.2. The Nelson-Denny Reading Test score averaged 23.2 with a standard deviation of 18.3 and a standard error of 1.9.

The mean value of the GEFT (17.7) was used to determine assignment to field-dependent or field-independent groups. Subjects with GEFT scores of less than 18 were designated as field-dependent, while subjects with GEFT scores of 18 and over were designated as field-independent. Subjects designated as field-dependent members of the treatment group were exposed to SIGI. This group numbered 41 and consisted of 26 females and 15 males. The mean pre-CMI score was 31.5 with a standard deviation of 8.8 and standard error of 1.4. The mean Nelson-Denny Reading Test score was 18.4 with a standard deviation of 9.7 and standard error of 1.6. The equivalent Santa Fe Community College percentile reading Nelson-Denny Reading Test score was in the 37th percentile. The field-dependent treatment group had a mean GEFT score of 8.14 with a standard deviation of 4.7 and a standard error of .7.

The subjects found to have a field-independent cognitive style numbered 57. This group consisted of 25 females and 32 males. These field-independent subjects had a pre-CMI mean score of 35.1 with a standard deviation of 8.9 and a standard error of 1.2. The Nelson-Denny Reading Test score averaged 26.7 (equivalent to the 58th percentile performance at Santa Fe Community College) with a standard deviation of 22.1 and a standard error of 3.1. The mean GEFT for this field-independent treatment (SIGI) group was 28.7 with a standard deviation of 6.8 and a standard error of .9.

Of the two hundred subjects in the entire subject pool, 102 were assigned to No SIGI (control) groups. The group of controls (as of yet unclassified by cognitive style) obtained a mean score of 33.6 on the pre-CMI score with a standard deviation of 6.7 and a standard error of .66. The mean Nelson-Denny Reading Test score was 14.1 with a standard deviation of 13.8 and a standard error of measurement of 1.37. The mean GEFT score was 15.4 with 9.0 standard deviation and .89 standard error.

Next, these control subjects were assigned to their field-dependent and field-independent groups. The field-dependent control subjects (56 in number) were 30 females and 26 males with a mean pre-CMI score of 32.9 with a standard deviation of 7.0 and a standard error of .94. The Nelson-Denny Reading Test mean score was 10.8 with a standard deviation of 8.6 and a standard error of 1.2. This was equivalent to the Santa Fe Community College reading vocabulary percentile score of 16. The average GEFT score for this group was 8.3 with a standard deviation of 4.9 and a standard error of .65.

A total of 46 field-independent control subjects were identified with 28 females and 18 males. The mean pre-CMI score was 37.3 with a standard deviation of 5.47 and standard error of .81. The average Nelson-Denny Reading Test score was 17.8 with a standard deviation of 17.67 and a standard error of 2.6, which corresponds to a Santa Fe Community College percentile of 34 for reading ability. The average GEFT score was 23.9 with a standard deviation of .57 and a standard error of .45.

Posttest Performance

At the conclusion of the experiment, the subjects in all four groups were required to perform again on the CMI. The field-independent

SIGI group had a mean post-CMI score of 38.6 with a standard deviation of 4.8 and a standard error of .64. The CMI change score (pre-CMI administration subtracted from the post-CMI administration) was 3.56 for the field-independent SIGI group with a standard deviation of 6.7. The field-independent No SIGI group had a mean post-CMI score of 36.9 with a standard deviation of 6.0 and standard error of .88. The CMI change score was -.41 with a standard deviation of 4.5,

The field-dependent SIGI group had a mean post-CMI score of 35.2 with a standard deviation of 6.5 and a standard error of 1.02. The mean CMI change score was 3.6 with a standard deviation of 6.5. The field-dependent No SIGI group had a mean post-CMI score of 33.7 with a standard deviation of 6.6 and a standard error of .87. The average CMI change score was .71 with a standard deviation of 4.2.

The preceding results are summarized by Table 1.

TABLE 1
Summary of Test Results

	Field-dependent No SIGI	Field-dependent SIGI	Field-independent No SIGI	Field-independent SIGI
Number of subjects	56	41	46	57
Female (%)	30(54)	26(63)	28(61)	25(44)
Male (%)	26(46)	15(37)	18(39)	32(56)
Nelson-Denny Reading Test score	10.83	18.39	17.86	26.67
Pre-CMI score	32.96	31.51	37.34	35.05
Group Embedded Figures Test score	8.30	8.14	23.97	28.71
Post-CMI score	33.67	35.19	36.93	38.61
CMI change (post - pre)	+ .71	+3.68	- .41	+3.56

Sex Differences in Performance on Test Results

Previous research (Witkin et al., 1975; Darlington, 1978) found sex differences in cognitive style. Females are often found to have slightly lower scores on measures of field-independence-dependence than males. Table 2 is a summary of test performance classified by treatment group versus control group and sex.

TABLE 2
Summary of Test Performance Classified by Sex

	Female SIGI	Female No SIGI	Male SIGI	Male No SIGI
Number of subjects	51	58	47	44
CMI pretest	35.43	34.75	31.55	35.18
Nelson-Denny Reading Test score	24.19	14.34	22.06	13.56
GEFT scores	18.88	15.77	21.44	14.84
CMI posttest	37.33	34.86	37.02	35.52
CMI change (post - pre)	+1.90	+ .10	+5.46	+ .34

The 109 females in the research had an average GEFT score of 17.23 and the 91 males had an average of 18.25. These findings are consistent with sex differences found in previous research. Sex differences in verbal ability as measured by the Nelson-Denny Reading Test occurred in the other direction with the female subjects having an average vocabulary score of 18.06 and the males having an average score of 16.99.

The experimental design called for use of the Nelson-Denny Reading Test score to control for possible confounding due to verbal ability. Collection of the Nelson-Denny reading scores allowed for such statistical control when the analysis was conducted to test the hypotheses.

Results of Hypotheses Testing

Hypothesis I

Ho_1: There will be no significant difference between field-dependent and field-independent groups on initial CMI scores.

This null hypothesis was rejected. It was tested using a three factor fixed effects analysis of variance. The three factors were group (SIGI, No SIGI), cognitive style (field-independent, field-dependent), and sex (male, female). The analysis of variance was implemented by using the general linear model procedure (Barr et al., 1976). The results of this analysis are displayed in Table 3.

TABLE 3
Analysis of Variance with Pretest CMI
Score as Dependent Variable

(a)

Source of variation	Degrees of freedom	Sum of squares	Mean square	F value	PR > F
Model	7	1426.38	203.76	3.52	.0015
Error	192	11117.03	57.90		
Corrected total	199	12543.42			

(b)

Source of variation	Degrees of freedom	Type I sum of squares	F value	PR > F
Group	1	93.772	1.62	.20
Sex	1	143.521	2.48	.11
Style	1	816.798	14.11	.0002
Group x Sex	1	364.585	6.30	.0129
Sex x Style	1	.418	.01	.93
Group x Style	1	.006	.00	.99
Group x Sex x Style	1	7.279	.13	.72

The analysis of variance resulted in an f ratio of 14.11 upon 1 and 192 degrees of freedom. The alternative hypothesis of a significant group difference is accepted with a confidence interval of 99.98% (an alpha level of .0002) which is substantially greater than the 95% interval that is required. The mean pre-CMI score for the field-dependent group was 32.35 and the pre-CMI score for field-independent groups was 36.08. The intercorrelation for the entire sample between the pre-CMI and the GEFT was .29. This regression is significant for 200 subjects but it only explains 8% of their common variance.

This result, that cognitive style does correlate with higher initial levels of career maturity, suggests that the field-independent subjects either brought a greater level of career maturity to the experiment or they were more able to identify the underlying constructs of career maturity as measured by the CMI. A rapid grasp of the underlying construct of career maturity could explain the higher CMI scores. Such a grasp of the construct and subsequent higher scores does not necessarily mean that the independent higher scores consistently behave in a more career mature fashion. This comparison of initial CMI scores was also conducted to substantiate the appropriateness of the use of an analysis of covariance for the testing of Hypothesis IV. Finding that cognitive style groups do differ on the initial level of the dependent variable (the CMI), suggests that the analysis of covariance is appropriate (Kirk, 1969; Campbell and Stanley, 1963). Specifically, the treatment of choice is to use the posttest administration of the CMI as the dependent variable and to use the pretest CMI as one of the covariates in the full factorial analysis of covariance model. This procedure is recommended more highly than an alternative, such as an often used procedure which uses the change score (in this case, post-CMI minus the pre-CMI) as a dependent variable.

An examination of the analysis of variance table will also show that no other classification of subjects, except a group x sex interaction on the pre-CMI showed any significant differences on the pre-CMI. There were no effects for treatment group (SIGI versus No SIGI), sex or any other interaction upon pre-CMI. The group x sex interaction was significant at an alpha level of .013 with an f ratio of 6.30. The female SIGI classification had a mean pre-CMI score of 35.43; the mean pre-CMI scores for the male SIGI, female No SIGI, and male No SIGI classifications were 31.55, 34.75, and 35.18, respectively.

Hypothesis II

> Ho_2: There will be no significant difference between field-dependent and field-independent groups in the values structure found in the Values section of SIGI.

This null hypothesis was rejected. It was tested using a two-group discriminant analysis and using only SIGI (experimental) subjects. The data from the individual student records was collected from the $Value_6$ variable in the SIGI system as recorded by the computer during the students' use of SIGI. The $Value_6$ contains the 10 restricted value weights that the subject has selected and made to sum to 40 after the SIGI values game. These data were taken from the computer after the SIGI group had finished SIGI. By using this two-group discriminant analysis (Harris, 1975), the field-independent values profile formed one group and the field-dependent values profile formed a second group. This is a multivariate technique which tests for the similarity of the two groups based upon scores for a multiple number of variables--as in the 10 SIGI values. A significant result for a two-group discriminant analysis means that the two groups represent different profiles. Also, the results can be used to classify unknown observations into the appropriate group membership based upon profile variables.

The result of the discriminant analysis was such that Null Hypothesis II was rejected at an alpha level of .0002 (a confidence interval of 99.98%). This resulted from a chi-square value of 99.41 with 55 degrees of freedom. Figure 1 displays the restricted value weights (SIGI variable Value_6) for field-dependent and field-independent groups. The discriminate analysis shows these two profiles to be statistically different.

The discriminant analysis procedure in A Users Guide to the Statistical Analysis System next applies the classifiable criteria just developed to the original observations and classifies each observation. The number of "misses" gives a ratio of accuracy. Table 4 is the display of group membership and classification for each of the observations. Group one is the field-dependent SIGI group and group two is the field-independent SIGI group.

The discriminant analysis classified 56 of the 63 observations correctly for a correct classification score of 89%. The next table (Table 5) shows the mean values profile for field-independent and field-dependent groups as returned from the raw values weights in Value_6. (The data in this table are the same shown in Figure 1.)

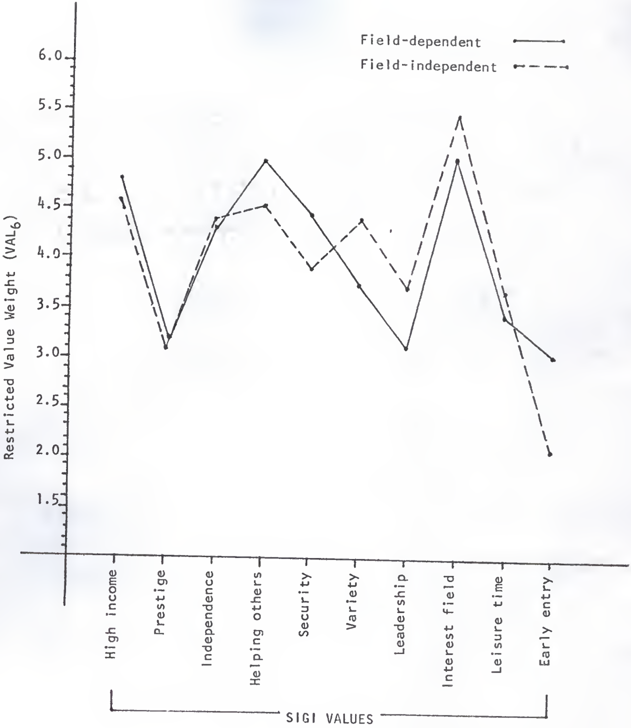

FIGURE 1. Comparison of Value Profiles for Field-Dependent and Field-Independent Groups Restricted Value Weights (VAL_6).

TABLE 4
Discriminant Analysis on the Field-Dependent and Field-Independent SIGI Subjects

Observation	From group	Classified into group	Posterior probability of membership in group: 1	2
1	1	1	0.9988	0.0012
2	1	1	0.9777	0.0223
3	1	1	0.8765	0.1235
4	1	1	0.9601	0.0399
5	1	1	0.9469	0.0531
6	1	1	0.9483	0.0517
7	1	1	0.9996	0.0004
8	1	1	0.9948	0.0052
9	1	1	0.9949	0.0051
10	1	1	0.9999	0.0001
11	1	2*	0.4137	0.5863
12	1	1	0.7096	0.2904
13	1	1	0.9831	0.0169
14	1	1	0.9973	0.0027
15	1	1	0.8835	0.1165
16	1	1	0.9549	0.0451
17	1	1	0.8852	0.1148
18	1	1	0.7130	0.2870
19	1	1	1.0000	0.0000
20	1	1	0.9774	0.0226
21	1	1	0.6553	0.3447
22	1	1	1.0000	0.0000
23	1	1	1.0000	0.0000
24	1	1	0.9990	0.0010
25	1	1	0.9940	0.0060
26	1	2*	0.1277	0.8723
27	1	1	1.0000	0.0000
28	1	1	0.9996	0.0004
29	1	1	0.9965	0.0035
30	1	1	0.8174	0.1826
31	1	2*	0.2073	0.7927
32	1	1	0.9485	0.0515
33	2	2	0.0035	0.9965
34	2	1*	0.8412	0.1588
35	2	2	0.0079	0.9921
36	2	2	0.0491	0.9509
37	2	2	0.3885	0.6115
38	2	2	0.1326	0.8674
39	2	2	0.2880	0.7120
40	2	2	0.0000	1.0000
41	2	2	0.0000	1.0000
42	2	2	0.2803	0.7197
43	2	2	0.0151	0.9849
44	2	2	0.0510	0.9490
45	2	2	0.2533	0.7467

continued

TABLE 4 continued

Observation	From group	Classified into group	Posterior probability of membership in group: 1	2
46	2	2	0.4946	0.5054
47	2	2	0.3335	0.6665
48	2	2	0.0119	0.9881
49	2	1*	0.5309	0.4691
50	2	2	0.1690	0.8310
51	2	2	0.0579	0.9421
52	2	2	0.1199	0.8801
53	2	2	0.0733	0.9267
54	2	1*	0.5992	0.4008
55	2	2	0.1134	0.8866
56	2	2	0.0000	1.0000
57	2	2	0.4234	0.5766
58	2	2	0.0023	0.9977
59	2	2	0.4652	0.5348
60	2	1*	0.7817	0.2183
61	2	2	0.0198	0.9802
62	2	2	0.0000	1.0000
63	2	2	0.0078	0.9922

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*Misclassified observation.

TABLE 5
Restricted SIGI Value Weights

Value	N	Mean	Standard deviation	Minimum value	Maximum value
		Field-dependent			
Income	32	4.75000000	1.70388550	0.00000000	7.00000000
Prestige	32	3.12500000	1.38540782	1.00000000	5.00000000
Independence	32	4.31250000	1.55413081	1.00000000	8.00000000
Helping others	32	4.93750000	2.29919341	0.00000000	8.00000000
Security	32	4.43750000	1.86543258	0.00000000	8.00000000
Variety	32	3.75000000	1.77800178	1.00000000	8.00000000
Leadership	32	3.15625000	1.77998505	0.00000000	7.00000000
Interest	32	5.06250000	1.72154282	0.00000000	8.00000000
Leisure	32	3.43750000	1.56447456	0.00000000	6.00000000
Early entry	32	3.09375000	1.83794020	0.00000000	8.00000000
		Field-independent			
Income	31	4.58064516	1.40888120	2.00000000	8.00000000
Prestige	31	3.19354839	1.79665160	0.00000000	7.00000000
Independence	31	4.38709677	1.64676287	0.00000000	8.00000000
Helping others	31	4.51612903	2.42034388	0.00000000	8.00000000
Security	31	3.87096774	1.49982078	0.00000000	7.00000000
Variety	31	4.41935484	1.43234525	2.00000000	8.00000000
Leadership	31	3.70967742	1.77376339	0.00000000	7.00000000
Interest	31	5.45161290	1.36231934	3.00000000	8.00000000
Leisure	31	3.67741935	1.62043403	0.00000000	6.00000000
Early entry	31	2.06451613	1.45912037	0.00000000	4.00000000

These value weights for the full group with both field-independent and field-dependent subjects combined, is as follows in Table 6:

TABLE 6
Restricted Value Weights for Full Sample

Value	N	Mean	Standard deviation	Minimum value	Maximum value
Income	63	4.66666667	1.55542754	0.00000000	8.00000000
Prestige	63	3.15873016	1.58832788	0.00000000	7.00000000
Independence	63	4.34920635	1.58784425	0.00000000	8.00000000
Helping others	63	4.73015873	2.35006074	0.00000000	8.00000000
Security	63	4.15873016	1.70583769	0.00000000	8.00000000
Variety	63	4.07936508	1.63925226	1.00000000	8.00000000
Leadership	63	3.42857143	1.78446961	0.00000000	7.00000000
Interest	63	5.25396825	1.55509832	0.00000000	8.00000000
Leisure	63	3.55555556	1.58396988	0.00000000	6.00000000
Early entry	63	2.58730159	1.72864781	0.00000000	8.00000000

These mean restricted value weights, for all 63 subjects, are very close to the value weights Sampson et al. (1978) obtained for a large national sample of SIGI users from both two year and four year schools. This agreement between the values profiles obtained from the large national sample and the present study is additional evidence of the representativeness of our current sample. A more detailed discussion comparing the values profile for the current sample with the large national sample will follow in the next chapter.

Hypothesis III

> Ho_3: There will be no significant differences between the field-dependent and field-independent on clusters of occupations found in the Locate section of SIGI.

This null hypothesis was accepted. It was tested using a 2 x C Chi-square contingency analysis (Snedecor and Cochran, 1967) in the SAS system. A tabulation of occupations returned from $Locate_4$ for both of the cognitive style groups in SIGI is shown in Table 7.

Next, the computer was used to breakdown the full tabulation into the 2 x 90 contingency table used for testing Hypothesis III. Table 7 is a display of the contingency table. The field-dependent subjects are group one and the field-independent subjects are group two. The Chi-square test applied to the full 2 x 90 table failed to show any significant differences between the two groups on the full set of occupations returned from $Locate_4$ in the Locate section of SIGI. Specific occupations were returned significantly more often for a particular cognitive style. These are shown in Table 8.

TABLE 7
Tabulation of Occupations Returned from
Locate$_4$ for Both Groups

Occupation	SIGI Occupation Number	Frequency	Percentage
Advertising Copywriter	102	1	0.189
Appliance Repair Tech.	106	1	0.189
Architect	107	5	0.945
Beautician	114	1	0.189
Botanist	115	3	0.567
Bank Officer	118	26	4.915
Commercial Artist	120	1	0.189
Chemist	123	1	0.189
Clergy	124	20	3.781
Civil Engineer	127	5	0.945
Dentist	129	18	3.403
Dental Hygienist	130	1	0.189
Dietitian	132	4	0.756
Diesel Mechanic	135	1	0.189
Electrical/Electronics Engineer	136	1	0.189
Engineer Technician	137	1	0.189
Fine Artist/Private Art Teacher	139	1	0.189
Funeral Director	140	3	0.567
Flight Engineer	141	1	0.189
Forester	143	3	0.567
Geographer	144	2	0.378
Home Economist	145	6	1.134
Hotel/Motel Manager	146	3	0.567
Insurance Agent	147	4	0.756
Industrial Engineer	149	6	1.134
Industrial Designer	151	1	0.189
Librarian	154	7	1.323
Labor Relations Specialist	155	13	2.457
Lawyer	157	18	3.403
Mathematician	158	2	0.378
Physician	159	20	3.781
Mechanical Engineer	160	1	0.189
Medical Records Admin.	162	5	0.945
Market Researcher	165	2	0.378
Manufacturer's Salesworker	166	3	0.567
Machinist	169	1	0.189
Newspaper Reporter	171	2	0.378
Oceanographer	172	2	0.378
Occupational Therapist	174	11	2.079
Police Officer	176	7	1.323
Public Health Specialist	177	8	1.512
Piolet	178	6	1.134
Political Scientist	179	5	0.945
Pharmacist	180	3	0.567
Nurse, Licensed Practical	181	2	0.378
Physical Therapist	185	5	0.945
Production Manager	187	3	0.567

continued

TABLE 7 continued

Occupation	SIGI Occupation Number	Frequency	Percentage
Psychologist	188	15	2.836
Rehabilitation Counselor	190	7	1.323
Real Estate Agent	192	1	0.189
Nurse, Registered	193	5	0.945
Respiration Therapist	194	3	0.567
Retail Store Manager	195	4	0.756
Recreation Worker	197	7	1.323
Systems Analyst	198	1	0.189
Soil Conservationist	199	3	0.567
School Counselor	202	21	3.970
Social Service Aide	204	1	0.189
Speech Path./Audiologist	205	14	2.647
Social Worker	208	2	0.378
Tool and Die Maker	211	1	0.189
Teacher, Elementary School	212	10	1.890
Zoologist	213	2	0.378
Veterinarian	217	7	1.323
Teacher, Art	220	13	2.457
Teacher, Biology	221	7	1.323
Teacher, Business	222	12	2.268
Teacher, English/Language Arts	223	11	2.079
Teacher, Foreign Language	224	5	0.945
Teacher, History/Social Studies	225	10	1.890
Teacher, Industrial Arts	226	10	1.890
Teacher, Mathematics	227	5	0.945
Teacher, Physical Education	228	9	1.701
Teacher, Physical Science	229	11	2.079
Aerospace Engineer	231	1	0.189
Firefighter	232	2	0.378
Landscape Architect	234	1	0.189
Optometrist	236	17	3.214
Teacher, Preschool	237	2	0.378
Teacher, Special Education	238	9	1.701
Construction Inspector	239	4	0.756
Hospital Administrator	242	11	2.079
Physician's Assistant	243	2	0.378
Nursing Assistant	246	1	0.189
Teacher, Vocational/Technical	248	18	3.403
Food Science/Technologist	251	4	0.756
Television Producer	252	2	0.378
Interpreter/Translator	253	3	0.567
Legal Assistant	254	3	0.567
TOTAL		526	100.000

TABLE 8
Selection Comparison for Occupations With Significant Selection Differences by Cognitive Style Groups

Occupation number	Description	Field-depend. Times selected		Field-indep. Times selected		Total times selected
		Times selected	%	Times selected	%	
124	Clergy	8	42	11	58	19
129	Dentist	5	28	13	72	18
159	Physician	8	40	12	60	20
202	School Counselor	8	40	12	60	20
220	Art Teacher	8	62	5	38	13
248	Voc./Tech. Teacher	10	59	7	41	17

The differences in selection rates of the six occupations by the cognitive style groups shown in Table 8 are explained by the weights that the field-dependent and field-independent groups attached to early entry. The selection differences by the field-independent and field-dependent groups are significant at the $p < .05$ level or better for all six of the occupations. These results were obtained from a Chi-square with 89 degrees of freedom. As shown in Table 5, the mean weight for early entry for the field-dependent was 3.09, with a value of 7.06 for the field-independent group. Also, the mean value weights for high income were 4.75 and 4.58 for the field-dependent and field-independent groups, respectively. The value weights for the early entry value significantly (much higher for the field-dependent subjects) and the value weights for high income do not differ significantly. These two values are the most determinant of occupational selections returned in the Locate section of SIGI. Both groups valued high income, thereby eliminating that difference between the two groups from the occupational sort in Locate. The field-independent subjects were not as concerned as the field-depependent subjects with early entry. So, the computer returned the occupations of clergy, dentist, physician, and school counselor to the field-independent groups more often. Also, the computer returned the occupations of art teacher and vocational/technical teacher to the field-dependent group significantly more often than to the field-independent group. Here, the desire to avoid additional education (as felt by the field-dependent subjects) accounted for the selection differences found in occupational choice for these six occupations. As a result, the SIGI system returned occupational selections to research subjects in a manner that was not consistent with expectations based upon cognitive style.

Hypothesis IV

> Ho_4: There will be no significant difference between field-dependent and field-independent groups upon change in career maturity after finishing SIGI and behavioral science and career development courses.

This null hypothesis was accepted. It was tested in two stages. The first stage involved testing for significant group differences on ending levels of career maturity rather than changes in career maturity after exposure to SIGI or control treatments. In this way, the influence of cognitive style could be most thoroughly tested in relation to ending levels of career maturity and then changes in career maturity. The test for effects upon changes in career maturity was done with an analysis of covariance as discussed in Chapter III. This procedure involved using the three factor fixed effects analysis of covariance with the dependent variable being the CMI post score and two covariates. The two covariates were the CMI pretest and the Nelson-Denny Reading Test scores. The analysis of covariance was used in preference to simple analysis of variance with the CMI change score as the dependent variable. The procedure used here of using the post-score as dependent variable is a procedure by Kirk (1969) and Campbell and Stanley (1963).

Campbell and Stanley (1963, p. 23) state that "the most widely used acceptable test is to compute for each group pretest-posttest gain scores and to compute a t between experimental and control groups on these gain scores. Randomized 'blocking' or 'leveling' on pretest scores and the analysis of covariance are usually preferable to simple gain-score comparisons."

The fixed factors used as classification variables in the analysis of covariance were cognitive style group (field-dependent and field-independent), treatment group (SIGI, No SIGI), and sex (male, female). The fully-crossed three factor model allowed for the testing of all first order interactions (treatment group by sex, treatment group by cognitive style, and sex by cognitive style) and the one second interaction. Use of such a model allowed for the testing of the influence of the state variable (treatment group) versus the trait variable (cognitive style) upon the level of final career maturity. Sex differences were also studied with this model. The analysis of covariance results are shown in Table 9.

TABLE 9
Analysis of Covariance Upon Final Levels of Career Maturity

(a)

Dependent variable: Post-CMI

Source	Degrees of freedom	Sum of squares	Mean square	F value	PR > F
Model	9	4116.13455311	457.34828368	24.25	0.0001
Error	182	3432.98523855	18.86255626		
Corrected total	191	7549.11979167			

continued

TABLE 9 continued

(b)

Source	Degrees of freedom	Type I sum of squares	F value	PR > F
Main Effects:				
Group	1	197.17011846	10.45	0.0015
Sex	1	0.17531349	9.01	0.9233
Style	1	585.06943051	31.02	0.0001
Interactions:				
Group x Sex	1	66.24914311	3.51	0.0625
Group x Style	1	8.42239509	0.45	0.5048
Sex x Style	1	0.55535125	0.03	0.8640
Group x Sex x Style	1	10.39670886	0.55	0.4588
Covariates:				
Pre-CMI	1	3194.67526420	169.37	0.0001
Pre-Nelson-Denny Reading Test	1	53.42082814	2.83	0.0941

The main effects of treatment group and cognitive style both produced significant results. The f value for the full model was 24.25 on 9 and 102 degrees of freedom with an alpha level of .0001. The clearly significant results for the cognitive style group factor (f ratio of 31.02) allow recognition of cognitive style and SIGI as associated with final level of career maturity. The treatment group factor (SIGI, No SIGI) also produced significant results with a f ratio of 10.45, resulting in an alpha level of .0015 (a confidence interval of 99.85%). An examination of the analysis of variance table shows that the main effects factor of sex was not significant. No interactions produced significant results at the .05 (95% confidence interval) level or better.

The summary of the post-CMI score is shown in Table 10 for both levels of treatment SIGI, No SIGI, and cognitive style.

TABLE 10
Post-CMI Score: Treatment by Cognitive Style

	SIGI	No SIGI	Cognitive style means for post-CMI
Field-dependent	35.19	33.67	34.31
Field-independent	38.61	36.93	37.86
Treatment means for post-CMI	37.18	35.14	36.14

Null Hypothesis IV was tested using a fixed effects analysis of variance with the same factors as discussed previously for the testing of the final levels of career maturity. The analysis of variance was used to test the effects of cognitive style and SIGI upon changes in career maturity.

Table 11 is a similar 2 by 2 display for both levels of treatment (SIGI, No SIGI) and style (field-dependent, field-independent). In this table, the CMI change score (pre and post) is shown.

TABLE 11
CMI Change Score: Treatment by Cognitive Style

	SIGI	No SIGI	Cognitive style means for CMI change
Field-dependent	+ 3.68	+ .71	+ .97
Field-independent	+ 3.56	- .41	+ .94
Treatment means for CMI change	+ 3.61	+ .20	

The above table of CMI change scores shows a clear effect of SIGI for changing career maturity regardless of cognitive style. The greatest improvement in career maturity was observed in the field-dependent group that was exposed to SIGI. This could be attributed to the lower initial levels of career maturity associated with the field-dependent group; this group had the greatest potential for change.

The results for the post-CMI scores (Table,10) show that cognitive style and SIGI combine to produce the group with the greatest ending level of career maturity. However, this group having higher pretest career maturity did not show the greatest change in career maturity by virtue of exposure to SIGI. The analysis of covariance showed these ending levels of career maturity to be determined by significant treatment (SIGI) and cognitive style (field-independent) effects. These effects are not, in a statistical sense, interactive because no interaction effects were produced with significant f ratios. The following table is the analysis of variance results upon the CMI change score by cognitive style, sex, and treatment. These results require that we do not reject Null Hypothesis IV. Cognitive style did not significantly influence the effectiveness of SIGI in improving career maturity.

TABLE 12
Analysis of Variance Upon Change Score

(a)

Dependent variable: Change

Source	Degrees of freedom	Sum of squares	Mean square	F value	PR > F
Model	7	945.28065934	135.04009419	4.47	0.0001
Error	192	5794.59434066	30.18017886		
Corrected total	199	6739.87500000			

continued

TABLE 12 continued

(b)

Source	Degrees of freedom	Sum of squares	F value	PR > F
Main Effects:				
Group	1	945.28065934	19.22	0.0001
Sex	1	175.42549252	5.81	0.0169
Style	1	27.48866980	0.91	0.3411
Interactions:				
Group x Sex	1	156.59988448	5.19	0.0238
Sex x Style	1	4.75099180	0.16	0.6920
Group x Style	1	0.93406831'	0.03	0.8605
Group x Sex x Style	1	0.14832914	0.00	0.9442

The analysis of variance shows that there is no significant effect for cognitive style. Cognitive style does not directly influence the efficiency of SIGI for changing career maturity. SIGI is shown to be clearly effective for changing career maturity as measured by the CMI regardless of cognitive style. There is a significant effect for sex upon changes in career maturity and the effects of SIGI and sex do interact somewhat. Table 13 shows the mean CMI change scores by treatment and sex.

TABLE 13
CMI Change Scores by Sex and Treatment

	Male	Female	Treatment means for CMI change
SIGI	+ 5.46	+ 1.90	+ 3.61
No SIGI	+ .34	+ .10	+ .20
Sex mean for CMI change	+ 3.00	+ .95	+ 1.87

Male SIGI users experienced the greatest change in career maturity. Male control subjects also had higher levels of change than did female controls. Thus, the influence of the environmental state (SIGI treatment) was clearly more pronounced than the influence of the mediating variable (trait) of cognitive style in changing career maturity.

CHAPTER V

DISCUSSION OF FINDINGS AND COUNSELING IMPLICATIONS

Methodological Background

The present research investigated the influence that cognitive style had upon the effectiveness of a System of Interactive Guidance and Information (SIGI) in improving career maturity. Previous research (Pyle, 1977; Devine, 1976; Sampson, 1978) did not consider any individual difference dimension, such as cognitive style. Pyle compared the effectiveness of the computer based vocational guidance tool (SIGI) with a structured classroom activity (ACADEM) for improving career maturity. Career maturity was measured by Crites' Career Maturity Inventory. Pyle found that the SIGI treatment did produce improvement in career maturity while the ACADEM activity was not effective. Devine studied the effectiveness of SIGI improving career maturity; again, using the CMI attitude scale, finding no conclusive evidence that SIGI was a positive influence on career maturity as measured by the CMI. Sampson studied the effectiveness of SIGI in influencing career development when used in combination with various levels of counselor intervention. Sampson did not use the CMI as a dependent variable. Sampson's study also produced equivocal results with no clear effectiveness established for the SIGI treatment.

A major assumption guiding the present research was that an individual difference dimension (such as cognitive style) must be recognized and granted equal prior status as a possible determinant of career maturity or career development. There is no reason to assume that individual differences along such dimensions of cognitive or perceptual style would not exert any influence upon the effectiveness of a treatment. However, that assumption (that the student be viewed as a passive recipient of a treatment) seems to have been implicit in the three studies cited above. If a factor of individual difference had been considered (such as cognitive style), more conclusive results of either a confirmatory or disconfirmatory nature might have been obtained from the above mentioned research. Even if an individual difference dimension was not a substantial determinant of career maturity, it is most likely that such a trait would influence the effectiveness of an environmental treatment. Viewed in this way, an individual difference dimension such as cognitive style would function as a mediating variable. When the existence of a possibly strong mediating variable is suspected in a subject pool, proper experimental design dictates that such a variable be isolated and controlled for in a systematic way. One proper method is to group subjects according to their status on the mediating variable (as with our field-independent and field-dependent subjects), and to have all levels of such a classification occur within all levels of the treatment (experimental, control). This is the procedure that was followed in the present research; no such control over possible mediating variables was exerted in the above mentioned research. Sex differences were also controlled for and this method resulted in a fully factorial model with all levels of cognitive style, sex, and treatment being studied in combination. Such a model allowed a more conclusive examination of the independent and interactive, if any, effects of a mediating psychological trait (cognitive style), sex differences, and environmental manipulation (treatment).

In the design, execution, and interpretation of this research, the research subject has been viewed as an active processor of information rather than a "black-box" that receives inputs and return outputs to the environment. Such an orientation has insured that the present research was constructed in such a way that allowed the effects of the treatment to be studied with the influence of the mediating variable of cognitive style. This approach is the more consistent with an information processing approach (Neisser, 1976) to the study of psychological processes. Because the SIGI treatment is implemented in a manner that makes explicit use of a decision-making model (Katz, 1974), it was most appropriate to study the influence of an information processing style (cognitive style) upon the effectiveness of that treatment.

Summary of Findings

The present research produced the following conclusive results:

1. A positive correlation exists between degree of field-independence and initial (pretest) level of career maturity as measured by the CMI. A positive correlation was also found with career maturity and verbal ability.
2. Value preferences are different for field-dependent and field-independent individuals. The average field-dependent values profile is significantly different, as shown by a discriminant analysis, from the average field-independent values profile.
3. The SIGI system returned occupational selections to research subjects in a manner that was not fully consistent with expectations based upon cognitive style; but,, which was concordant with findings from a related study (Darlington, 1978).

4. SIGI was clearly effective of improving career maturity regardless of cognitive style. However, field-dependent subjects experienced the most growth in career maturity after exposure to SIGI. This suggests a possible asymptotic or other nonlinear relation between initial level of career maturity and effectiveness of the SIGI treatment.

Cognitive style and the SIGI treatment were both significantly associated with the ending levels of career maturity. This association with ending levels was independent of the results found for the improvement in career maturity discussed above and remained significant when the pretest levels of career maturity were controlled for.

A significant sex difference was found for the change in career maturity. The male subjects experienced the greatest gain in career maturity after exposure to SIGI (again, regardless of cognitive style). There was also somewhat of a sex/treatment interaction in which cognitive style was, again, not directly related.

Interpretation of Findings

The initial level of career maturity was found to be significantly related to cognitive style. The field-independent subjects could be expected to more quickly recognize the responses to items on attitude questionnaires that make up a construct, such as career maturity. This propensity toward faster recognition follows from higher analytical abilities and results in a greater speed of recognition for the responses that are indicative of career maturity. Also, career maturity, as measured by Crites' Attitude Scale (1973), requires attitudes and competencies, such as decision-making, analysis, and independence of thought, that are less comfortable for, though not lacking in, field-dependent subjects.

The mean value profile for the field-independent subjects was found to be significantly different from the values profile of the field-dependent subjects. The value weights for the full sample were shown in the previous chapter as were the weights for the field-dependent and field-independent SIGI groups. Sampson, Stripling and Pyle (1978) reported on the value preferences of a national sample of over 3,654 SIGI users. The following table compares the value preferences for the full SIGI group, both field-independent and field-dependent combined, from the present research with the value profile of the large national sample (N = 3,654) in the Sampson et al. study.

TABLE 14
Comparison of Value Profiles of Local Research
Sample and Large National Sample

Values	National mean	Local mean	Discrepancy
Interest field	5.43	5.25	- .18
High income	4.74	4.66	- .08
Security	4.58	4.15	- .43
Helping others	4.44	4.73	+ .29
Independence	4.44	4.34	- .10
Variety	4.32	4.07	- .25
Leisure	3.40	3.55	+ .15
Leadership	3.39	3.42	+ .03
Prestige	3.06	3.15	+ .09
Early entry	2.16	2.58	+ .43

Although some disagreement does exist between the two samples, the profiles are largely common. The greatest difference occurs with early entry, security, variety, and helping others. The current sample was more concerned with early entry, despite the fact that this was also their lowest rated value, and helping others than was the national sample. The local sample was less concerned about job security and variety.

These differences in value structure could be partially accounted for by consideration of the educational status and geographical location of the samples. The national sample had a longer proportion of four-year college students and students from Western and Northern geographical areas.

Results of the discriminant analysis showed that the values profiles between the field-dependent and field-independent groups were different and could be used to reliably classify persons into either the field-dependent or field-independent groups about 89% of the time when the cognitive style was unknown. Both groups (dependent and independent) had very similar weights for high income, prestige, and independence. Field-dependent subjects found helping others, security, and early entry to be more important than did the field-independent subjects. Field-independent subjects valued variety, leadership, interest field, and somewhat, leisure time more than did the field-dependent subjects.

These value differences are in agreement with the results of Darlington's research in which field-dependent subjects had the higher value weight for helping others and the field-independent subjects had the highest mean weights for independence.

Previous research (Darlington, 1978) extensively investigated the relation between cognitive style and the subjects' behavior in the Locate section of SIGI. A consensus of opinion about cognitive style (Witkin et al., 1975) had developed with expectations about occupational interests and occupational choice. The bulk of the research outlined in the Witkin review that had dealt with cognitive style and occupational interests and choice, had been conducted with standard occupational interests surveys, such as the Strong Vocational Interest Blank (SVIB) or the Strong-Campbell Interest Inventory (SCII). These instruments were used for finding value structures which were later classified by cognitive style. It was from research of this general form that the expectations about cognitive style and occupational choice developed. Darlington's research produced expected matches between cognitive style and occupational choice in SIGI in some instances, but not in others. The results of the present research were equally equivocal. An explanation of this is offered here.

The SIGI system makes occupational choices based upon values and specifications by using a fixed algorithm. This algorithm operates in such a manner that many students' value weights and specifications for high income and early entry determine, to a change extent, classes of occupations that are left off of occupation lists. This exclusion on the basis of values and weights for early entry and high income operates regardless of the weights of the remaining portions of the value structure. This had the effect of keeping many occupations, that are concordant with field-dependent style, off the occupation lists of field-dependent subjects in the Locate section. This same effect operates to put some of these occupations that might be expected to fall on the lists of field-dependent subjects onto the lists of field-independent subjects.

For example, the research of Witkin et al. had suggested that the occupations of clergy and school counselor would, in terms of day-to-day work activities, be concordant with a field-dependent style. Likewise, the occupations of art teacher and vocational/technical teacher would be expected to be more concordant with field-independence. Our results showed that SIGI returned the occupations of clergy and school counselor significantly more often to field-independent than to field-dependent subjects. Despite the occupational appropriateness of these vocations for field-dependent subjects, the SIGI system rejected many field-dependent subjects during the occupational sort in Locate because of the early entry value. The mean value of 3.09 for early entry was sufficiently high to keep the clergy and school counselor occupations off the list of field-dependent students.

Of equal value in explaining the results to Hypothesis III would be the fact that very few occupations in SIGI (or elsewhere) seem to exist that have a heavy emphasis upon a people orientation and a very low emphasis upon a data interpretation. It would be expected that field-dependent students would have a low propensity for occupations requiring apprehension of large amounts of abstract information (data) but have a high affinity for occupations requiring social contact (people). An examination was made in the Dictionary of Occupational Titles (DOT) of the data/people requirements of the occupations in our SIGI group (both field-dependent and field-independent) that were returned five or more times. Table 15 displays the results.

TABLE 15
Returned SIGI Occupations Classified by
DOT Data-People Orientation

High data, high people	High data, low people	Low data, low people
Bank Officer	Aerospace Engineer	Teacher
Veterinarian	Architect	Biology
Clergy	Civil Engineer	Business
Optometrist	Home Economist	English
Dentist	Industrial Engineer	Foreign Language
Hospital Administrator	Librarian	History
Lawyer	Labor Relations Specialist	Industrial Arts
Physician	Medical Records Administrator	Math
Public Health Specialist	Occupational Therapist	Physical Education
Psychologist	Political Scientist	Science
Rehabilitation Counselor	Physical Therapist	Special Education
School Counselor	Nurse	Voc/Technical
Speech Pathologist	Art Teacher	Elementary Education
		Police Officer
		Pilot
		Recreation Worker

Note that there was no classification for low data, high people. This reflects a selection pressure toward individuals with cognitive restructuring skills, as in field-independent types, even for occupations that require a high degree of social contact during day-to-day activities. This same selection factor operates in SIGI in the occupational sort in the Locate section.

The results obtained from this research showed the influence of cognitive style upon the posttest (ending) levels of career maturity. The significant association of cognitive style and SIGI upon the ending levels of career maturity remain after the analysis of covariance controlled for the initial pretest levels of the CMI. Examination of the posttest means on the CMI for each of the four groups shows the following ordinal comparison of cognitive style and treatment combinations:

SIGI field-independent post CMI mean:	>	No SIGI field-independent post CMI mean:	>	SIGI field-dependent post CMI mean:	>	No SIGI field-dependent post CMI mean:
38.61		36.93		35.19		33.67

These means show that field-independence and SIGI were significantly associated with the ending levels of cognitive style; the field-independent subjects occupied the two highest cells on the posttest. The above means are posttest means which were used in the analysis of covariance as the dependent variable. The analysis of covariance adjusts expected cell means of the dependent variable according to across-cell levels of the covariates; the mean square values are, thus, adjusted for regression effects between the dependent variable and covariates before the f ratios are calculated (Snedecor and Cochran, 1967).

If an examination of the change scores is made, the following vector of means is generated:

SIGI field-dependent CMI change:	>	SIGI field-independent CMI change:	>	No SIGI field-dependent CMI change:	>	No SIGI field-independent CMI change:
+ 3.68		+ 3.56		+ .71		- .41

This shows that SIGI was clearly effective in promoting career maturity. Both of the highest cells occur with the SIGI treatment. The control (No SIGI) groups occupied the two lowest positions in the vector of mean change scores, the field-dependent groups who had initially lower CMI scores could be expected to show the greatest gains. The performance of all four groups on the CMI is displayed in Figure 2. Study of the change scores show that SIGI was clearly effective in improving career maturity. The change score results show that field-dependent cognitive style subjects gained the most from SIGI, while field-independent control subjects actually lost some CMI performance during the experimental period. The advantage observed by field-dependent subjects could be understood in light of their lower initial CMI scores. An asymptotic learning effect could be operating whereby gains in CMI might be difficult; and occur in a non-linear manner when initial scores are above a certain level. This would account for the behavior of our field-independent subjects who had initially higher levels of career maturity. These change scores show that cognitive style did not directly influence the effectiveness of SIGI for changing career maturity.

In summary, field-independence and SIGI were significantly associated with the final levels of career maturity; but the final levels were not determined by cognitive style--just associated with. In terms of changes

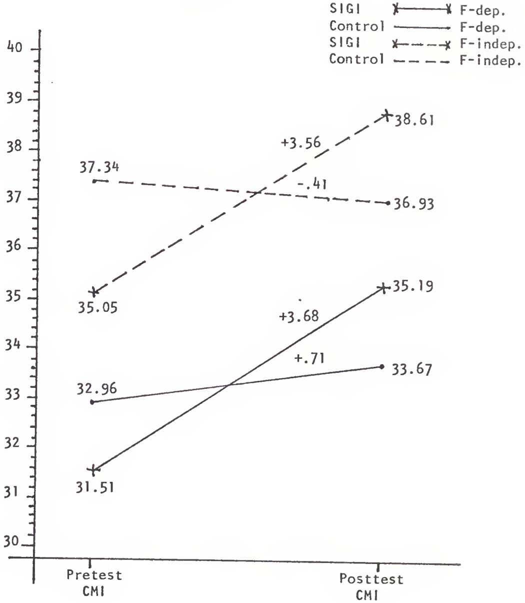

FIGURE 2. Performance on CMI by All Four Groups.

in career maturity, SIGI (the state variable) clearly determined improvement, but this improvement occurred largely independent of the mediating trait variable of cognitive style. The individual difference dimension of cognitive style did not markedly influence the effectiveness of SIGI in improving career maturity. A sex effect was found with males responding most to the SIGI treatment. This sex response occurred independently of cognitive style.

Practical Implications for Counseling and Further Research

Results obtained from the present research suggests several implications for the practice of vocational guidance and counseling. Cognitive style does not present any direct influence upon the effectiveness of a computer-based decision-making tool such as SIGI. Thus, one major dimension of cognitive, individual difference has been eliminated as a possible determinant of students' potential for learning of effective decision-making skills with access to a system such as SIGI. The present research failed to firmly establish the cognitive style dimension as a limitation upon a student's receptiveness to a computer-based career guidance tool. This suggests that funds spent upon such high technology counseling tools are well spent and in the general public interests.

It is encouraging that students with the least differentiated modes of cognitive style (field-dependence) gained the most from the SIGI experience. These students are a bit more numerous, having somewhat lower general ability levels, as estimated by the results of the Nelson-Denny Reading Test, and having lower levels of career maturity. Students with a more differentiated mode of cognitive style gained the least from SIGI.

These students (field-independence) have a higher level of general and analytical ability and they had higher levels of career maturity.

There are some procedures that a counselor could make use of during his or her counseling of students that follow from an understanding of cognitive style. Field-dependent students will be likely to learn the most about career decision-making when the counselor schedules group activities that focus upon career related materials within a social context. Use of any high technology or computer-based tools, such as SIGI, will be most effective; particularly for the socially influenced field-dependent student, when used in conjunction with a program of group activities. This is in agreement with the findings of Pyle (1977) and Sampson (1978) which also suggested that SIGI would be more effective for many students, but not necessarily for most, when used in conjunction with group activities.

The counselor would probably get the best results from using teaching or guidance techniques that were in keeping with the concept attainment differences related to cognitive style. Field-independent students have a decision-making style that favors sequential hypothesis testing. Exercises that are structured to make use of the analytical inclinations of field-independent persons and the more situationally determined and socially preferred interests of field-dependent students, would be well received. In this context, preferences to evidence and argument would be comfortable for field-independent students; where preferences to meaning and value would be comfortable for field-dependent students.

Conversely, a counselor could attempt to encourage the development of the complementary skills in each cognitive type. For example, field-independent students could be encouraged to sharpen their awareness of others as social beings and field-dependent students could be encouraged to work on their analytical skills. It would also be of benefit to program situations that would reqard field-dependent students for critical judgement and decision-making. Likewise, field-independent students could be reinforced for activities that would reward a more global and less articulated mode of cognition.

This last suggestion runs at odds with many of the prevailing expectations about an individual's behavior. The counselor should work hard, as should educators in general, to design learning environments that would allow the analytical and more differentiated cognitive skills of field-dependent students to emerge. The information processing skills of field-dependent students need to be developed; if many of them are not to be kept out of occupations whose day-to-day activities fit their style.

The proclivity of field-independent students toward more intrinsic (individualized) modes of reinforcement should be recognized, as should the inclination of field-dependent students toward more extrinsic (social) modes of reinforcement. The greater cognitive complexity of field-independent students should be attended to and the counselor could incorporate the, sometimes, idiosyncratic responses of the more field-independent students into the ongoing social milieu of the classroom. Also, the greater sensitivity and reaction to criticism of field-dependent students should be monitored.

Suggestions for Further Research

The present research investigated the influence that cognitive style had upon the effectiveness of a System of Interactive Guidance and Information.

From the results produced by this research, several avenues for future investigations follow.

Because SIGI is an activity that trains users in active decision-making skills, an instrument other than the CMI should be used as the dependent variable in future research. The CMI is an instrument that measures the strength of a structure of attitudes and is not fully sensitive to the measurement of behaviors developed by SIGI. The appropriate instrument to be used for measurement of the effectiveness of SIGI would be the Simulated Occupation Choice game (SOC) currently under development by the Educational Testing Service. The SOC returns valid results on a domain of behaviors isomorphic to the structure of SIGI. Use of the SOC could possibly return different results for research conducted upon the relation between cognitive style and effectiveness of SIGI. This is because the CMI, being an attitude scale, measures very different material than that influenced by SIGI, a decision-making training tool.

Additional investigation could be conducted with other interests inventories (SVIB, SCII) administered to the student at the completion of SIGI. This would provide additional information about the vocational interests of field-independent and field-dependent subjects. Another area that could be clarified by additional research is academic achievement. The relation between academic achievement and cognitive style requires further investigation. Of particular interest is the performance in different subject matters earned by field-independent and field-dependent subjects.

Further investigations on cognitive style and sex differences are also warranted. Since the traditional role of women in our society is changing vocationally. This may lend itself to a more fruitful, meaningful, and practical research undertaking.

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BIOGRAPHICAL SKETCH

Saint Elmo Cherry was born October 24, 1943, in Alachua, Florida, to Mrs. Beatrice Cherry and the late Rev. Benjamin H. Cherry. She attended elementary and secondary school in Alachua, Florida, where she was graduated from A. L. Mebane High School in 1960.

From 1960 to 1964, she attended Edward Waters College, Jacksonville, Florida, receiving a Bachelor of Science degree in English in May 1964. From September 1964 to June 1966, she worked in the Alachua County public school system as a teacher of English at the junior and senior high school levels. From September 1966 to June 1968, she taught elementary and junior/senior language arts at Westside High School, Lincolnton, Georgia. On returning to Florida, Miss Cherry accepted a teaching position at Lincoln High School and Gainesville High School during terms 1968-1970.

In March 1970, she received a Master of Education degree from Florida A&M University, Tallahassee, Florida. In August 1970, she accepted a counseling position at Santa Fe Community College in Gainesville, Florida. While working as a coordinator of curriculum of Operation Mainstream Project, then becoming involved in, at that time, the Counselor Aide Program, and then later becoming a teacher of Behavioral Science (BE-100), she received a Specialist in Education degree in March 1973 from the University of Florida. Presently, while pursuing a doctorate, she is an instructor in the Human Services Program at Santa Fe Community College in Gainesville, Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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